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IN REPLY REFER TO -127/2/6-362

Headquarters
Ballistic Systems Division
Air Force Systems Command
Norton Air Force Base
San Bernardino, California

Attention: BSRPQ-3 - Captain J. W. Mullins

And: BSRKP-3 - Mr. J. A. Weir

Subject: Contract AF 04(694)-127, WS-133A Minuteman Rocket Motor M57A1 Thin Skirt Structural Tests Final Report on Full Scale Forward Skirt Specimen W2SD-14A and Full Scale Case RH00283

Reference

(1) HPC Letter -127/2/6-128, "Transmittal of Test Plan for Qualification Testing of Thin Forward Skirts," Dated 4 December 1964

(2) HPC Letter -127/2/6-187, "Amendment to Test Plan for Qualification Testing of Thin Forward Skirts," Dated 8 December 1964

(3) HPC Letter -127/2/6-247, "Thin Skirt Structural Tests Quick-Look Reports on Full Scale Forward Skirt Specimen W2SD-14A and Full Scale Case RH00283," Dated 15 February 1965

Gentlemen:

Attached is the Final Report on the subject Thin Skirt Tests. This completes the test program as outlined in References (1) and (2), and (3).

Very truly yours,

M. W. PLUNKETT, MANAGER
MINUTEMAN PROGRAM

MWP:MFJensen:la

Enclosure

STATEMENT #2 UNCLASSIFIED

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FINAL REPORT ON QUALIFICATION TESTING OF WING II THROUGH WING VI CASES WITH THIN FORWARD SKIRTS

MTO-752-38

WEAPON SYSTEM 133A

1 July 1965

Contract Number AF 04(694)-127

Prepared by

HERCULES POWDER COMPANY
CHEMICAL PROPULSION DIVISION
Bacchus Works
Magna, Utah

Prepared for

HEADQUARTERS
AIR FORCE SYSTEMS COMMAND
UNITED STATES AIR FORCE
Los Angeles, California

Report No. MTO-752-38

Copy No. 20

Date 1 JULY 1965

FINAL REPORT ON QUALIFICATION TESTING OF WING II THROUGH WING VI CASES WITH THIN FORWARD SKIRTS

Prepared by

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FOREWORD

The Minuteman Third Stage motor case is wound from continuous glass filaments and has forward and aft skirts which are integrally wound to the pressure vessel. These skirts are made up of continuous glass filaments and of layers of glass cloth which are layed up on the skirt mandrel by hand. Because of the hand lay-up process it is not uncommon to realize small variations in skirt thickness.

This report describes the results of a qualification test series that was necessitated by a deviation from the specified thickness of the forward skirt on Drawing No. 01A00221.

This program was conducted under Contract No. AF 04(694)-127.

Published by

Minuteman Engineering Group
HERCULES POWDER COMPANY
Bacchus Works
Magna, Utah

ABSTRACT

This test series was conducted to determine the ultimate capability of Minuteman Third Stage motor cases having a forward skirt thickness below the 0.158 inch minimum as specified by Drawing No. 01A00221. A full scale motor and a forward skirt specimen were used to determine this capability.

The forward skirt specimen had an average thickness of 0.157 inch with a minimum of 0.152 inch. Failure occurred under the combined effects of 63.7 kips axial compression load and 29.7 psig overpressure. This exceeds the required loads of 46.3 kips axial compression load and 28.9 psig overpressure. The mode of failure was an inward buckling of the skirt over the entire circumference.

The full scale case had an average forward skirt thickness of 0.155 inch with a minimum of 0.149 inch. Failure occurred under the combined effects of 40.84 kips axial compression load, 7.68 kips shear load and 717.02 in-kips bending moment at an average external surface temperature of 160 ^{o}F giving an equivalent axial load of 117.24 kips. The required loads for this test are 18.50 kips axial compression load, 7.23 kips shear load, and 725.50 in-kips bending moment at an external surface temperature of 160 ^{o}F giving an equivalent axial load of 95.99 kips. The mode of failure was a buckling of the forward skirt over approximately 320 degrees of the circumference.

These tests successfully demonstrated that cases with a forward skirt thickness as much as 0.009 inch below the 0.158 inch minimum, per Drawing No. 01A00221 are capable of withstanding the present flight loads requirement.

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SECTION I

INTRODUCTION

A. BACKGROUND

The design of the Wing II Design X, Third Stage Minuteman motor case was established in October of 1962. The limits for the forward skirt thickness dimension were 0.158 inch to 0.190 inch. This configuration was qualified through preproduction testing of cases that were fabricated with a cam controlled type winding machine. Throughout the period of manufacture of cases with this type of machine the skirt thickness was maintained within the specified limits.

Later on in the Wing II program (December, 1963) a new machine was introduced for fabrication of Third Stage motor cases. This machine utilized a numerical tape control system and had an electronic tension control in conjunction with an advanced glass filament delivery system.

Soon after the numerically controlled (N.C.) machine was incorporated into the system it became evident that the thickness of the forward skirt had decreased. This led to a study of the skirt thickness measurements on several hundred cases to determine the history and thickness trends of the Wing II skirt for various periods of time and to compare the difference due to different winding machines and various changes in the fabrication processes. The results of this study showed that the change in skirt thickness came at the same time as the change in winding machines. A comparison of machines showed that for a given setting the actual delivered tension by the cam controlled machine was less than that by the N.C. machine. This comparison is shown in Tables I and II.

The N.C. machine tension system was designed for a higher tension range than the cam controlled machine and was already operating on its lower range so the possibility of reducing tension to increase skirt thickness was not considered a good fix. To revert back to the original thickness would mean a design change in the delivery system of the N.C. machine. Since this was not practical a qualification test program was set up to qualify the as-built condition of the forward skirt. This plan consisted of structural tests on two (2) full scale skirt specimens and one (1) full scale motor case. These tests, if successful, would be adequate qualification of the cases with thin forward skirts for operational use.

The test results of the first full scale skirt specimen tested are presented in a separate report entitled "Final Report W2SD-13A, Wing VI Structural Skirt Test," dated 31 July 1964.

This report describes the tests and results of the second skirt test (W2SD-14A) and the full scale case test (RH00283). Skirt test W2SD-14A is a duplicate test of W2SD-13A.

B. PURPOSE

The primary purpose of tests W2SD-14A and RH00283 was to determine the structural integrity of Wing II - VI motor cases having forward skirts thinner than the minimum allowable dimension of 0.158 inch presently called out on Drawing 01A00221.

These tests were conducted at Hercules Powder Company's Engineering Test facilities, located at Bacchus, Utah, on the following dates:

W2SD-14A, Phase I (maximum wind shear loading) and Phase II (simulated silo launch) - 28 January 1965

RH00283, Phase I (simulated silo launch) - 1 February 1965

RH00283, Phase II (simulated flight loads) and Phase III (maximum wind shear loading) - 5 February 1965

C. TEST OBJECTIVES

1. To determine the capability of a "thin" Third Stage motor forward skirt to take combined flight loading conditions of axial load, shear load and bending moment experienced at the maximum wind shear condition of the flight cycle. This capability to be established at ambient temperature.

2. To determine the ultimate capability of this thin forward skirt specimen when loaded to failure with an increasing axial compressive load and at the same time subjected to silo over-pressure at ambient temperature.

3. To determine the capability of a full scale case with a "thin" skirt to withstand silo launch conditions at ambient temperature followed by Wing VI flight loads at elevated temperatures.

4. To determine the ultimate capability of this case when subjected to maximum wind shear conditions with an increasing axial load to failure at elevated temperatures.

SECTION II

TECHNICAL DISCUSSION

A. TEST SPECIMEN DESCRIPTION

1. Full Scale Skirt Sample (W2SD-14A)

Forward skirt sample W2SD-14A was constructed at Hercules Powder Company's Rocky Hill Plant, Rocky Hill, New Jersey, of Spiralloy (Spiralloy is a Hercules material made of glass roving windings, nylon roving windings, glass cloth and epoxy resins). The nominal outside diameter was 37.50 inches and the overall length of the Spiralloy skirt was 11.35 inches.

The winding geometry of the forward skirt test specimen consisted of two layers of 14.5 degree glass windings, nine layers of 143 reverse weave glass cloth, one layer of 90 degree glass windings and three layers of 90 degree nylon roving. The mean skirt thickness calculated from 72 measurements was 0.157 inch with a maximum thickness of 0.165 inch and a minimum thickness of 0.152 inch (see table III).

The skirt specimen in its finished condition was a Wing VI Operational configuration having forward skirt flight hardware consisting of G&C cable support bracketry, TT wiring clips, TT switch bracket, destruct S&A bracket, forward skirt vent cup, forward skirt G&C cable access hole with doubler plate, and forward skirt interstage ring. The aft end of the skirt specimen had an aluminum ring installed and machined to receive a simulated 2 - 3 interstage.

The preparation for the test, a metal-reinforced R&D section was attached to the forward skirt interstage ring using the standard nut plates present on the ring and a reinforced 2 - 3 interstage section was fastened to the aft end of the specimen utilizing the standard 2 - 3 interstage bolt hole pattern (72 bolts).

2. Full Scale Case (RH00283)

Case No. RH00283 was fabricated at Rocky Hill, New Jersey, per Drawing 01A00221-089. The forward skirt on this case was constructed of the same material and configuration as the skirt specimen above. The skirt is integrally wound to the case during the case fabrication process. The mean forward skirt thickness calculated from 72

measurements was 0.1546 inch with a maximum of 0.164 inch and a minimum of 0.149 inch (see table IV).

This case in its finished condition was a Wing VI Operational configuration having forward skirt flight hardware consisting of G&C cable support bracketry, TT wiring clips, TT switch bracket, destruct S&A bracket, forward skirt vent cup, forward skirt G&C, cable access hole with doubler plate, and forward skirt interstage ring. The case also had an aft skirt interstage ring and an operational raceway.

In preparation for the test a simulated R&D section was attached to the aft skirt interstage ring utilizing the standard 2 - 3 interstage bolt hole pattern (72 bolts).

B. TEST PROCEDURE

1. Full Scale Skirt Sample (W2SD14-A)

Following installation of the instrumentation (figure 1), the assembly was mounted in an upright position in the structural test stand. A rubber overpressure bladder backed up by a steel hoop was then placed around the skirt on the outside. The compression loading device consisted of a loading head and three hydraulic rams, designated P_1, P_2, and P_3. Ram P_1 was positioned on the base at 270 degrees and Ram P_2 at 90 degrees. Ram P_3 was mounted on the head 34 inches above the 2 - 3 interstage-skirt joint at 90 degrees. The force from Ram P_3 was normal to the longitudinal centerline of the case. The rubber bladder was connected to a pressurized water supply. Figure 2 illustrates the test setup. The instrumentation was attached to the recorders and checked for accuracy, polarity and calibration. Next the loads were applied as programmed in figure 3. Phase I, maximum wind shear loading was applied first, and then Phase II, silo overpressure combined with axial compression load was applied until failure occurred.

2. Full Scale Unit (Case No. RH00283)

For the first phase of the test, Case RH00283 was instrumented as shown in figure 4. After the instrumentation was applied the case was installed in the structural test stand in an upright position. A rubber overpressure bladder backed up by a steel hoop was placed around the forward skirt section of the case and was connected to a pressurized water supply. The test setup is illustrated in figure 5. After the normal instrumentation check the loads were applied in accordance with figure 6.

For the second phase of the test the apparatus was disassembled and the case reinstrumented as shown in figure 7. The case was reinstalled into the structural test stand as shown in figure 8. Heat lamps were placed around the case and all instrumentation was connected to recorders and calibrated. Loads were then applied to the case in accordance with figure 9 followed by loading to failure in accordance with figure 10.

C. TEST RESULTS

1. Skirt Sample

During the first phase of the test, which was the application of simulated flight loads for the maximum wind shear condition, the specimen saw the following maximum loads:

Axial load	18.22 kips
Shear load	7.53 kips
Bending moment	709.00 in-kips

The equivalent axial load for the above loads is 93.8 kips. This load was calculated using the following equation:

$$P_{eq.} = P_A + 2\,M/R$$

where:

$P_{eq.}$	=	Equivalent axial load
P_A	=	Applied axial load
M	=	Applied bending moment
R	=	Radius of case

The required loads at the maximum wind shear condition per BSD document 6680.14-6467 (Aerospace Vehicle Design Loads) dated 19 April 1963 are per figure 3 and as follows:

Axial load	18.50 kips
Shear load	7.23 kips
Bending moment	726.50 in-kips
Equivalent axial load	95.99 kips

Because of a modification resulting from a repair to the Test Stand which was not accounted for in the loading program, the bending moment load was lower than required. The test data are shown graphically in figures 11 through 17 and are listed in table V.

The maximum strain and deflection data at 40 seconds show net tension on the skirt from 0 degrees to approximately 160 degrees and compression over the remaining circumference. This indicates a slight shift of the neutral axis of bending on one side of the skirt from 180 degrees to 160 degrees. The strain and deflection data correlated very well around the circumference except at 270 degrees. The EDI reading and the strain readings on either side of 270 degrees indicate that the strain gage reading at 270 degrees was possibly in error.

Poissons ratio, when calculated from the strain readings, averages out to 0.292 in. compression and 0.228 in. tension.

During the second phase of the test which was the application of axial compressive load plus overpressure the specimen was loaded to failure with the following loads being applied at failure:

Axial load	63.72 kips
Overpressure	29.7 psig

Required silo loads for this phase of the test per BSD document 6680.6267 are per figure 3 and as follows:

Axial load	46.3 kips
Overpressure	28.9 psig

The mode of failure was a series of diamond shaped equally spaced buckled areas that extended completely around the circumference of the skirt. The center position of the "diamond" was buckled inward (see photos in figures 18 through 25). The data from this phase of the test are shown in figures 26 through 41 and table VI.

Those axial strains which were opposite the diamond "dimples" showed net tension up to 60 seconds at which time the overpressure was leveled off and held constant. At this point the increasing axial load overrode the effects of overpressure and reversed the direction of strain. The tension indicated during the first 60 seconds is a result of bending of the skirt wall due to application of external pressure. The E.D.I.'s also show tension up to 60 seconds due to bending. This does not mean that the skirt wall

was in tension itself but that the brackets attaching the E.D.I.'s to the skirt were being bent or "twisted" as a result of the external pressure load.

All data from this test indicates a normal reaction of the specimen to the imposed loads. This test was very similar to skirt test W2SD-13A which was subjected to the same loads.

2. FSU Case RH00283

During the first phase of the test, which was silo launch conditions (overpressure and axial load), the case saw the following maximum loads:

Axial load	48.4 kips
Overpressure	30.0 psig

This compares to the requirement per BSD Document 6680.14-6267 of:

Axial load	46.3 kips
Overpressure	28.9 psig

Test data for this phase are shown in figures 42 through 49 and table VII.

The strain readings show a slight amount of net tension in the axial direction due to the bending moment resulting from application of external pressure. The gages in the circumferential direction gave compressive readings. This again shows that at this particular location of the gages (at the midway point on the skirt) the reactions from overpressure bending are overriding the reactions from axial compression at the applied load levels. The bending effects were more predominant at the doubler plate reinforcement location (210 degree) as evidenced by strain gages 25 and 26.

During the second phase of the test the case was exposed to flight cycle loading as shown in figure 9. The specimen passed this phase of the test without any detrimental effects. Test data are shown in figures 50 through 61 and table VIII.

The general trends of the strain data correlate with the applied flight loads cycle. At approximately zero seconds, or silo launch, the axial strains are leaning slightly heavier in compression on the side 270 degrees from target. This is probably due to the

shear load (P_3) as it begins to influence the sample through a bending moment. It also appears that the compressive strains prior to this time are weighted a little more at 90 degrees and 270 degrees. This would suggest influence of the two opposite jacks applying concentrated loads through the loading head.

At the maximum wind shear condition (approximately 30 seconds) the strain readings verify the bending moment about the 0 degree - 180 degree axis. These readings show net tension on the 90 degree side of the neutral axis and compression on the 270 degree side. These strains also verify the presence of an axial compressive load in addition to the bending moment due to the fact that the strain readings are not equal and opposite about the neutral axis of bending. The strains on the compression side are considerably higher than those on the tension side.

Following this loading the specimen was subjected to maximum wind shear conditions with the axial load increased to failure. The maximum loads applied at failure were as follows:

Axial load	40.84 kips
Shear load	7.68 kips
Bending moment	717.02 in-kips
Equivalent axial load . . .	117.32 kips

The required loads from BSD document 6680.14-6467 are as follows:

Axial load	18.50 kips
Shear load	7.23 kips
Bending moment	726.50 in-kips
Equivalent axial load . . .	95.99 kips

Test data from the failure cycle are shown in figures 62 through 76 and table IX.

A change in strain rate can be seen at 30 seconds due to the leveling off of the bending and shear loads. At this point the data indicates the neutral axis is parallel to the 0 degree - 180 degree axis but is shifted slightly to the 90 degree side. The point of maximum compression was at approximately 280 degrees from target and the point of maximum tension at approximately 100 degrees from target. This position remained constant until failure occurred at 58 seconds from the time of initial load application.

The mode of failure was a circumferential buckling of the forward skirt approximately 8 inches aft of the forward bearing surface. The failure extended completely around the circumference of the skirt (see figures 77 through 80).

SECTION III

CONCLUSIONS

1. The objectives of these tests were met in that the ultimate capability of a Third Stage motor forward skirt having a thickness less than 0.158 in. was determined.

2. These tests demonstrated that a motor case having a mean forward skirt thickness of 0.155 in. and a minimum thickness of 0.150 in. is capable of withstanding Wing II through Wing VI flight loads.

3. Data obtained from these tests can be used as an aid in evaluating cases with skirts of less thickness than those tested in this series.

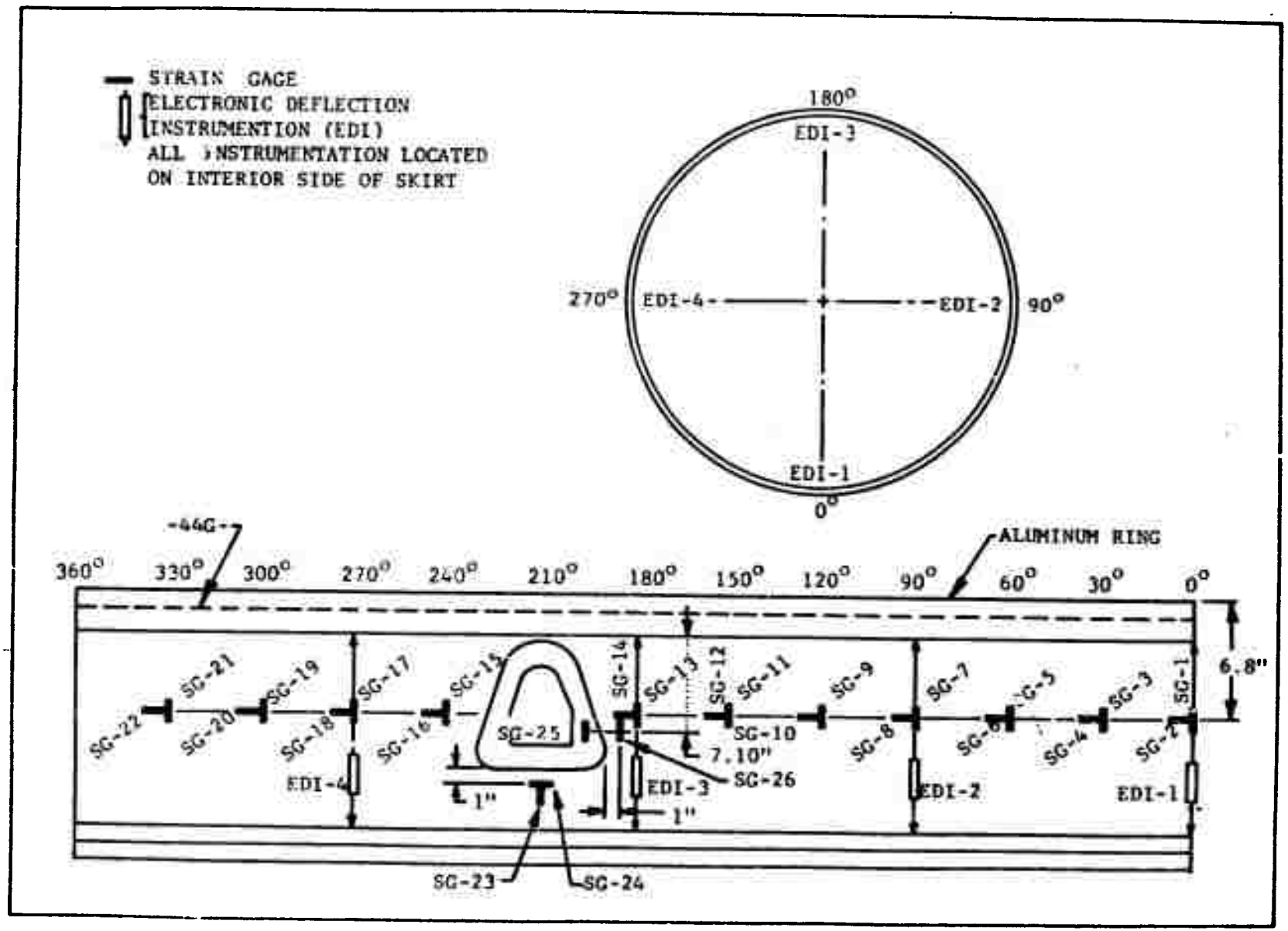
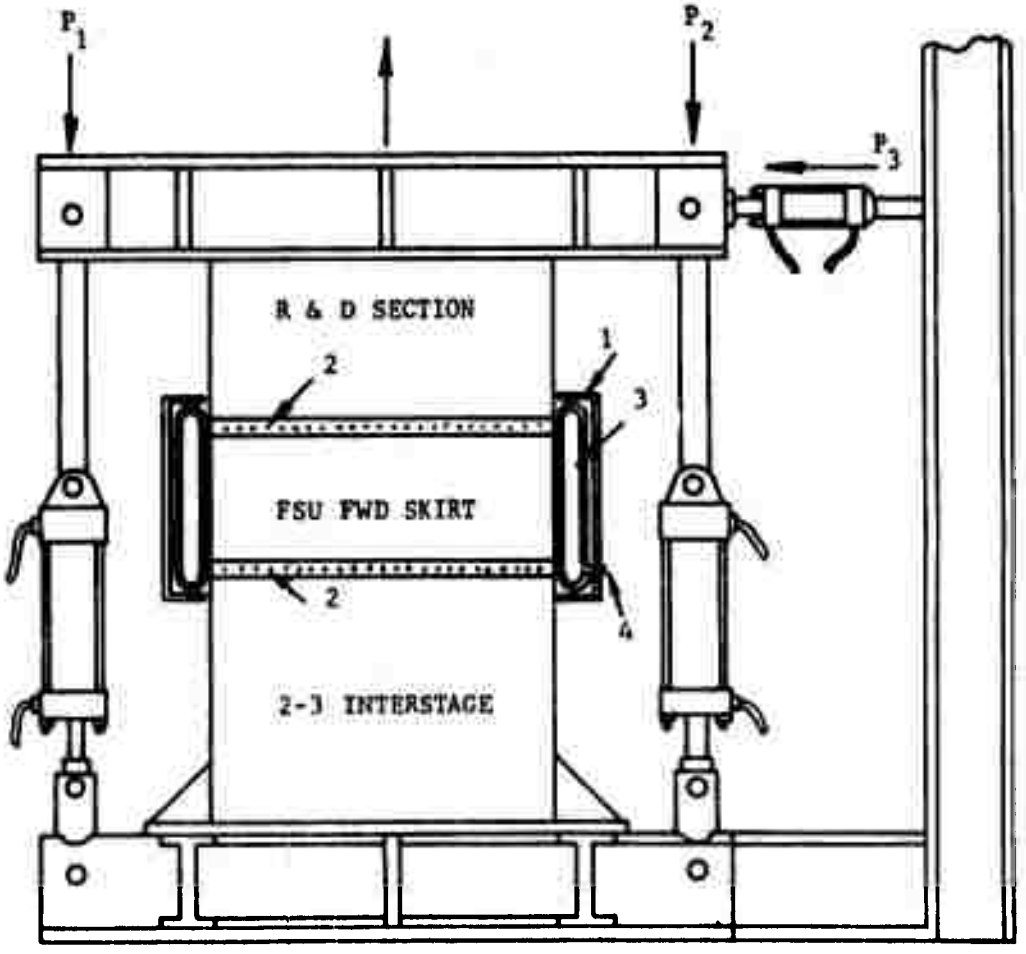


FIGURE 1 Instrumentation Location, W2SD-14A



1. STEEL JACKET (OVERPRESSURE)
2. TORQUE BOLTS TO 200 -220 IN. - LB.
3. RUBBER BLADDER (OVERPRESSURE)
4. PRESSURE SUPPLY

FIGURE 2 Test Setup, W2SD-14A

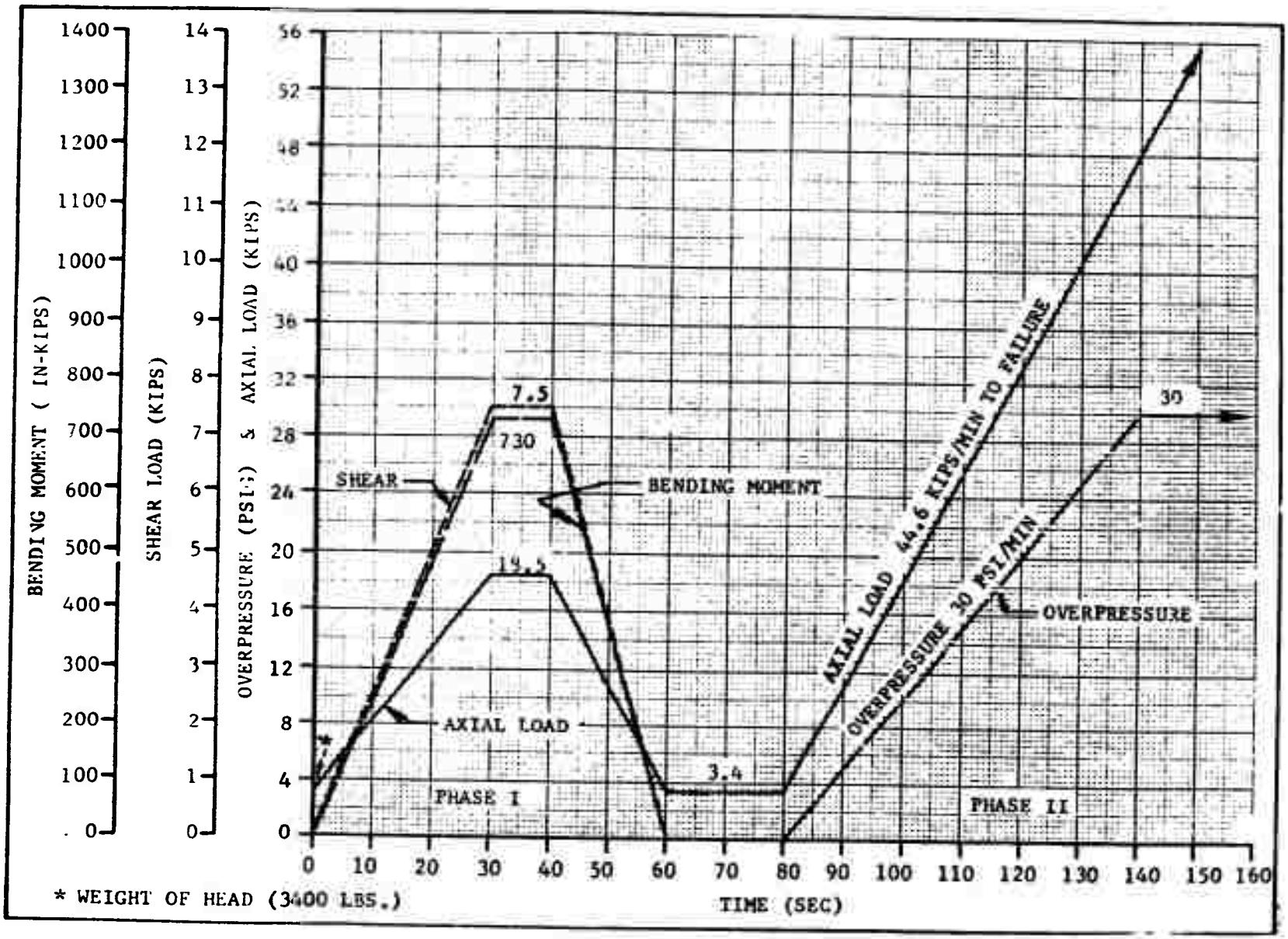


FIGURE 3 Programmed Loads, W2SD-14A

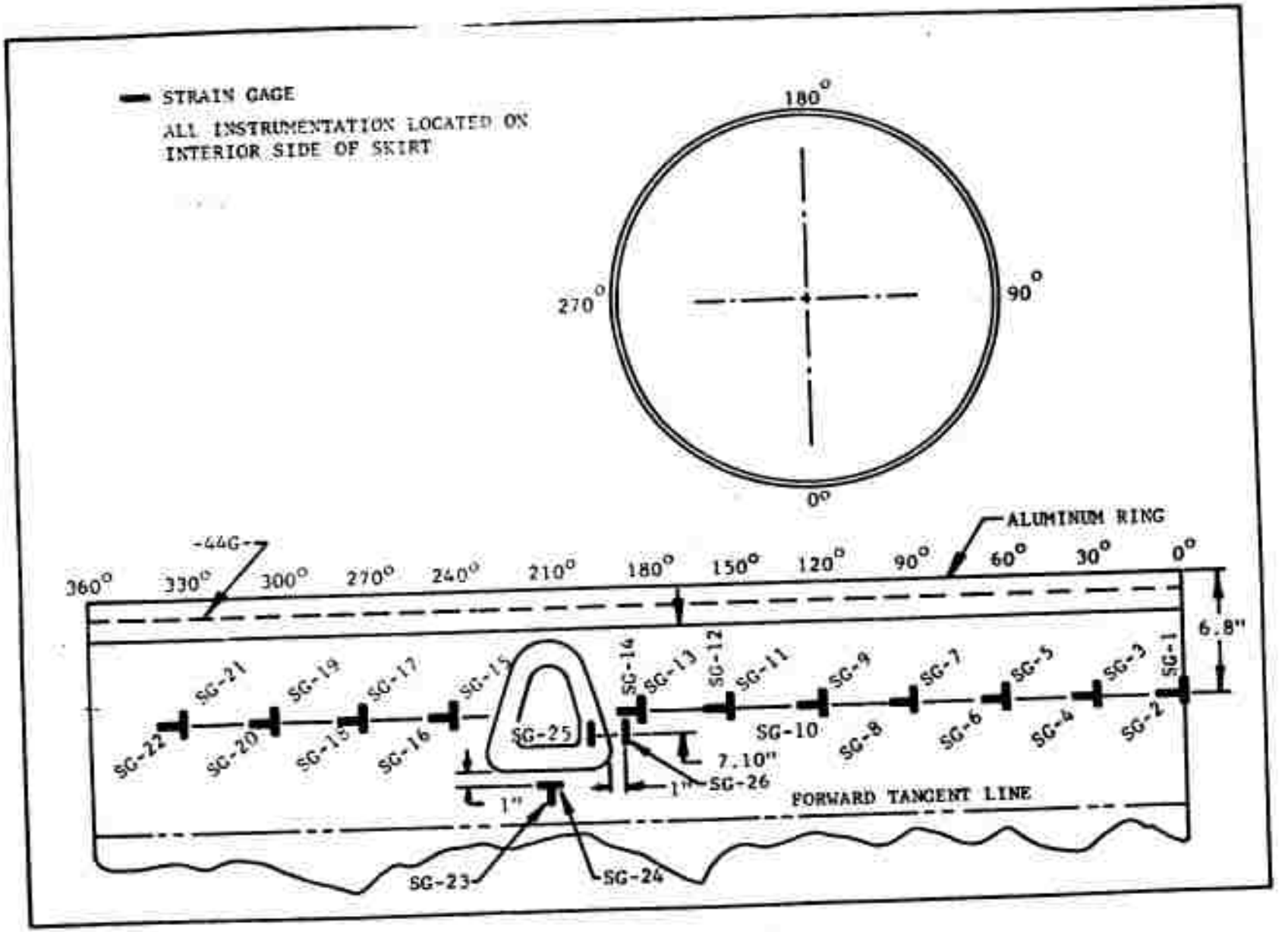


FIGURE 4 Instrumentation Location, Phase I, RH00283

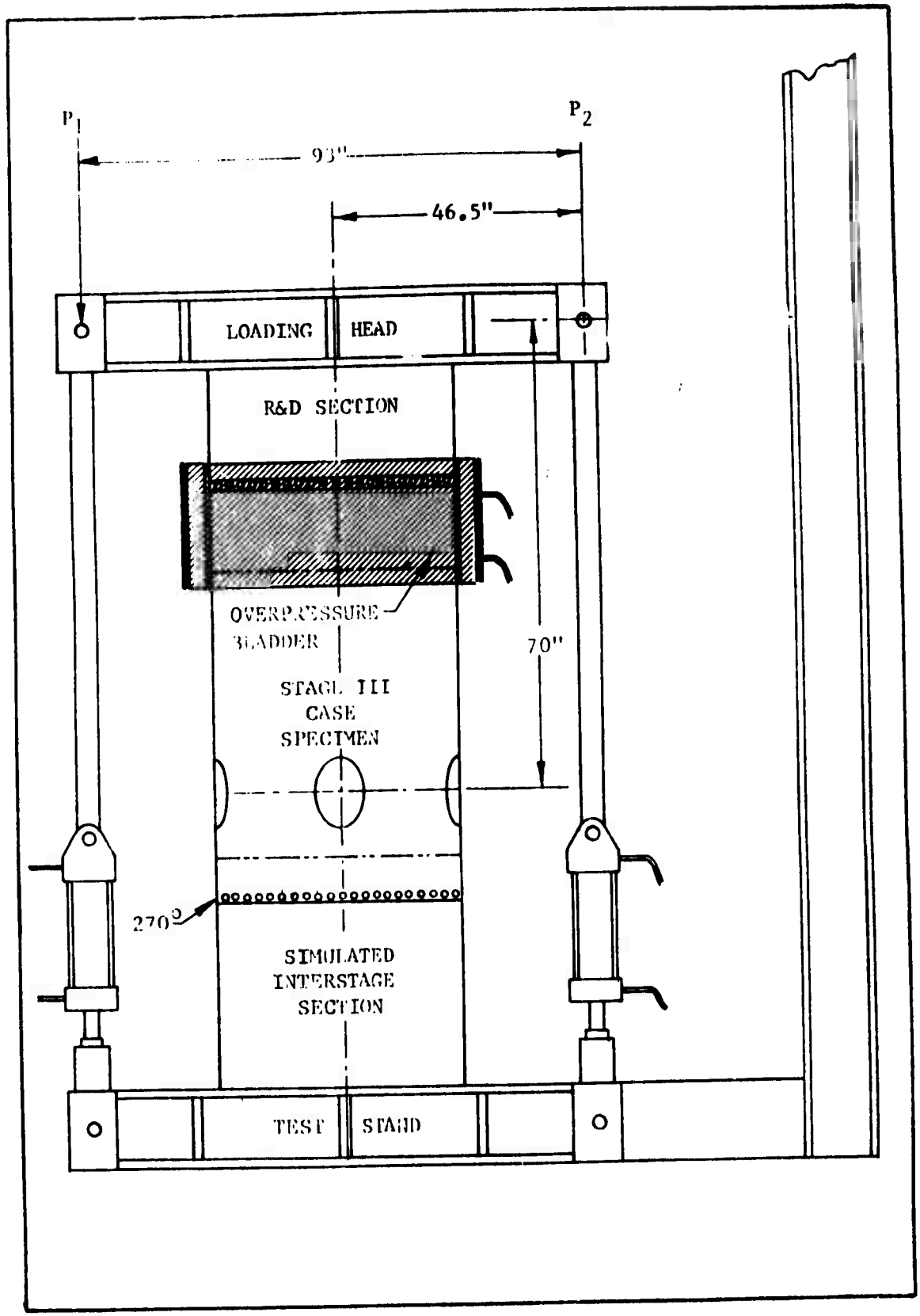


FIGURE 5 Test Setup, Phase I, RH00283

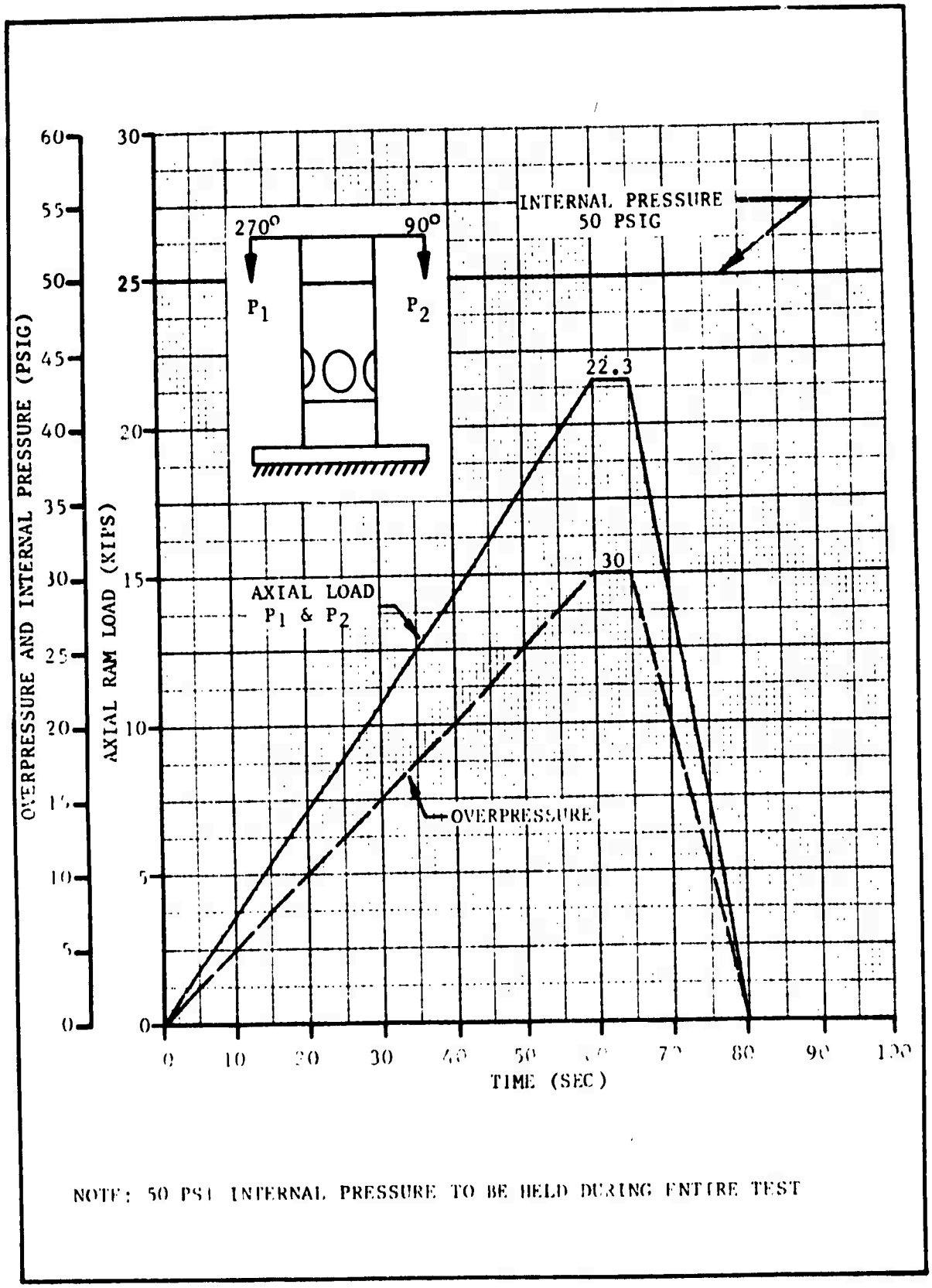


FIGURE 6 Programmed Loads, Phase I, RH00283

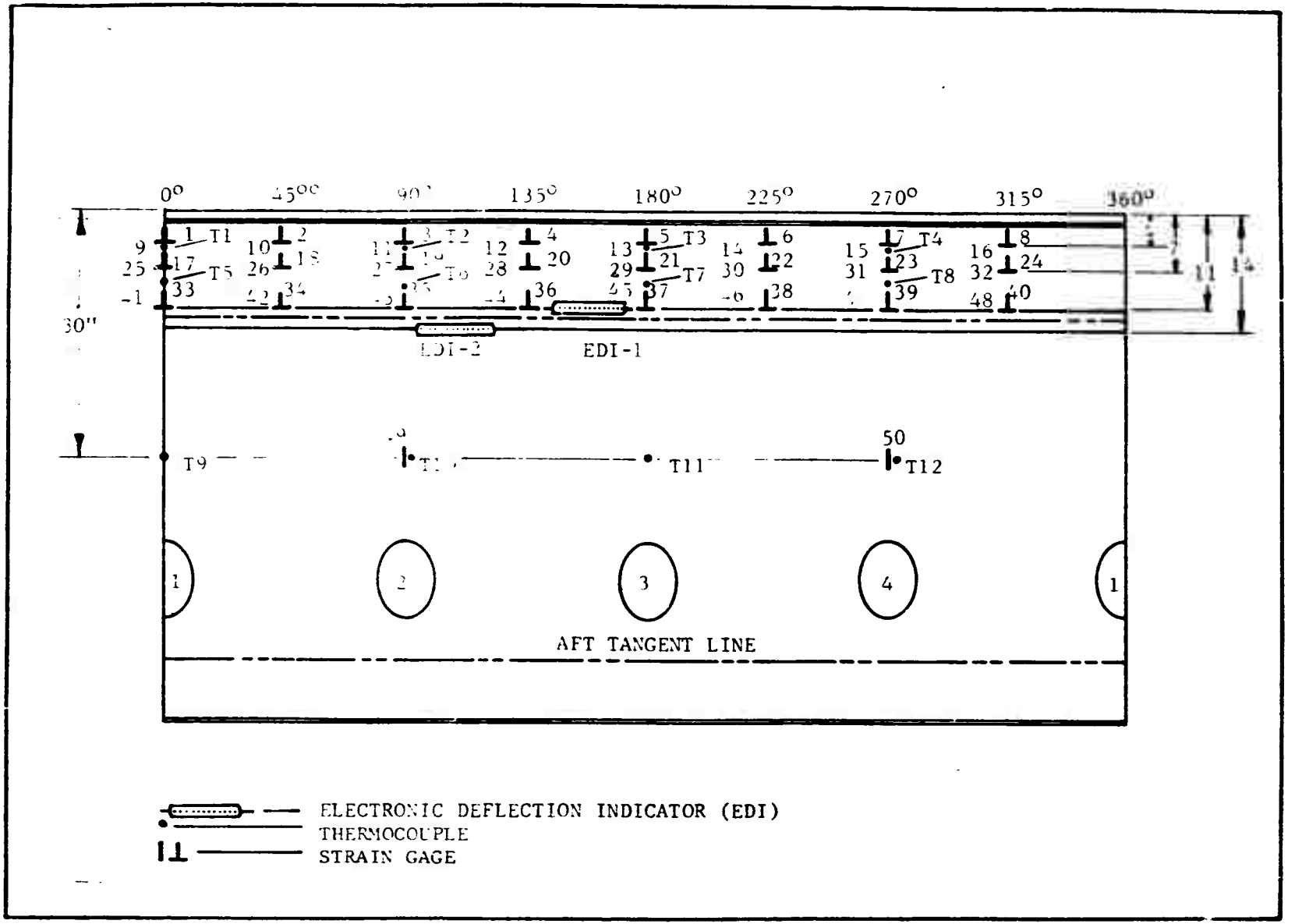


FIGURE 7 Instrumentation Location, Phase II and III, RH00283

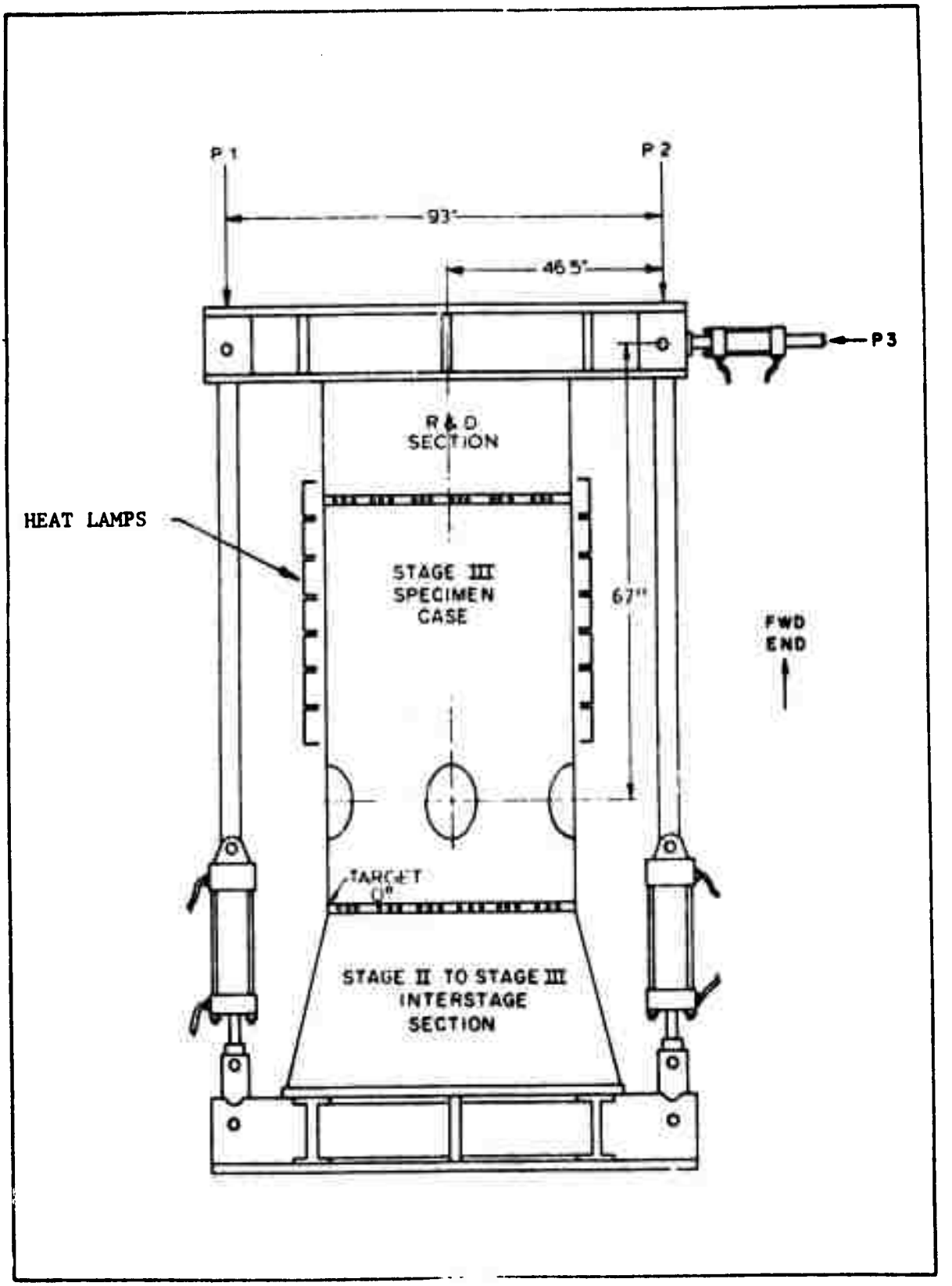


FIGURE 8 Test Setup, Phase II, RH00283

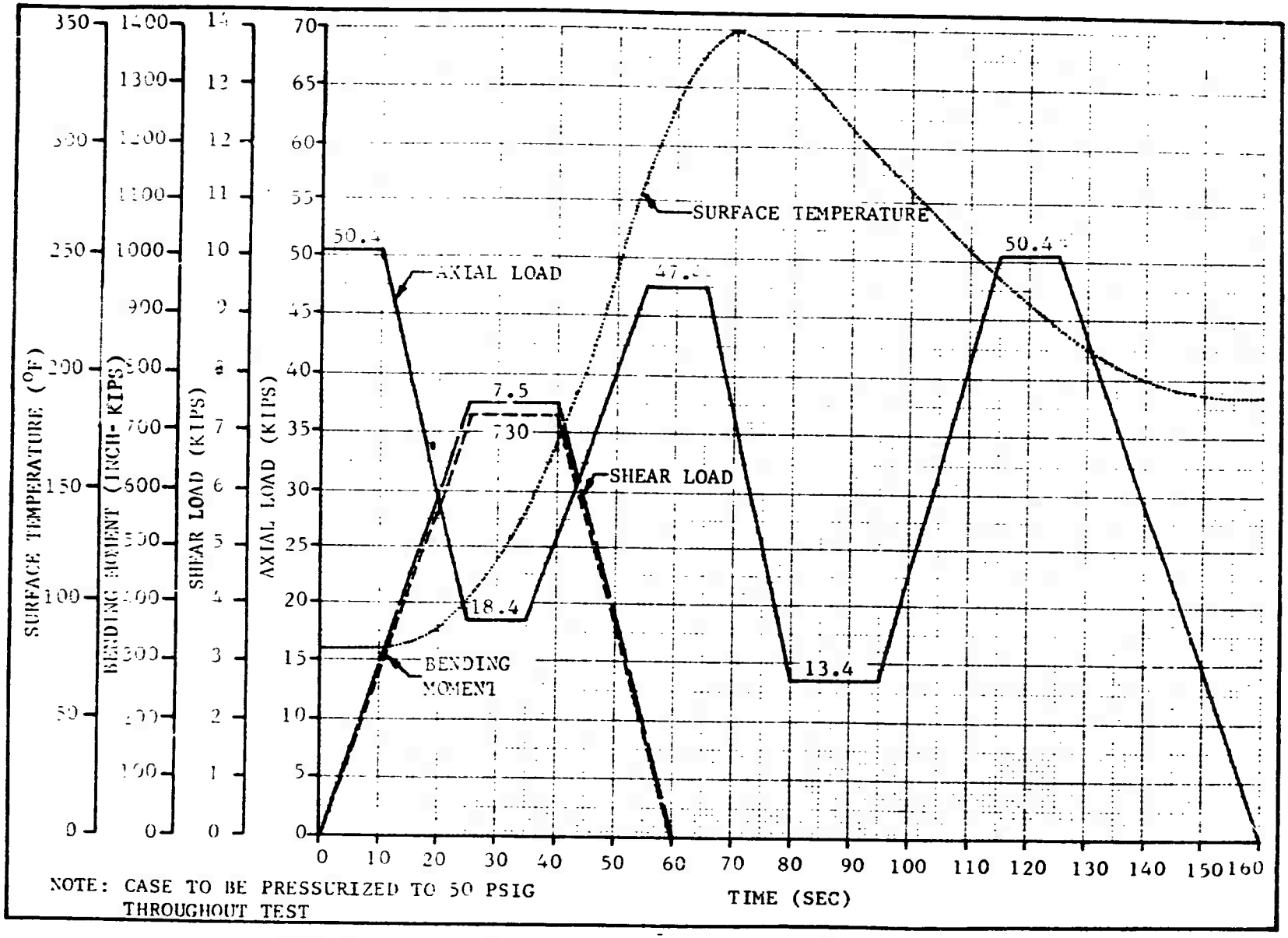


FIGURE 9 Programmed Loads, Phase II, RH00283

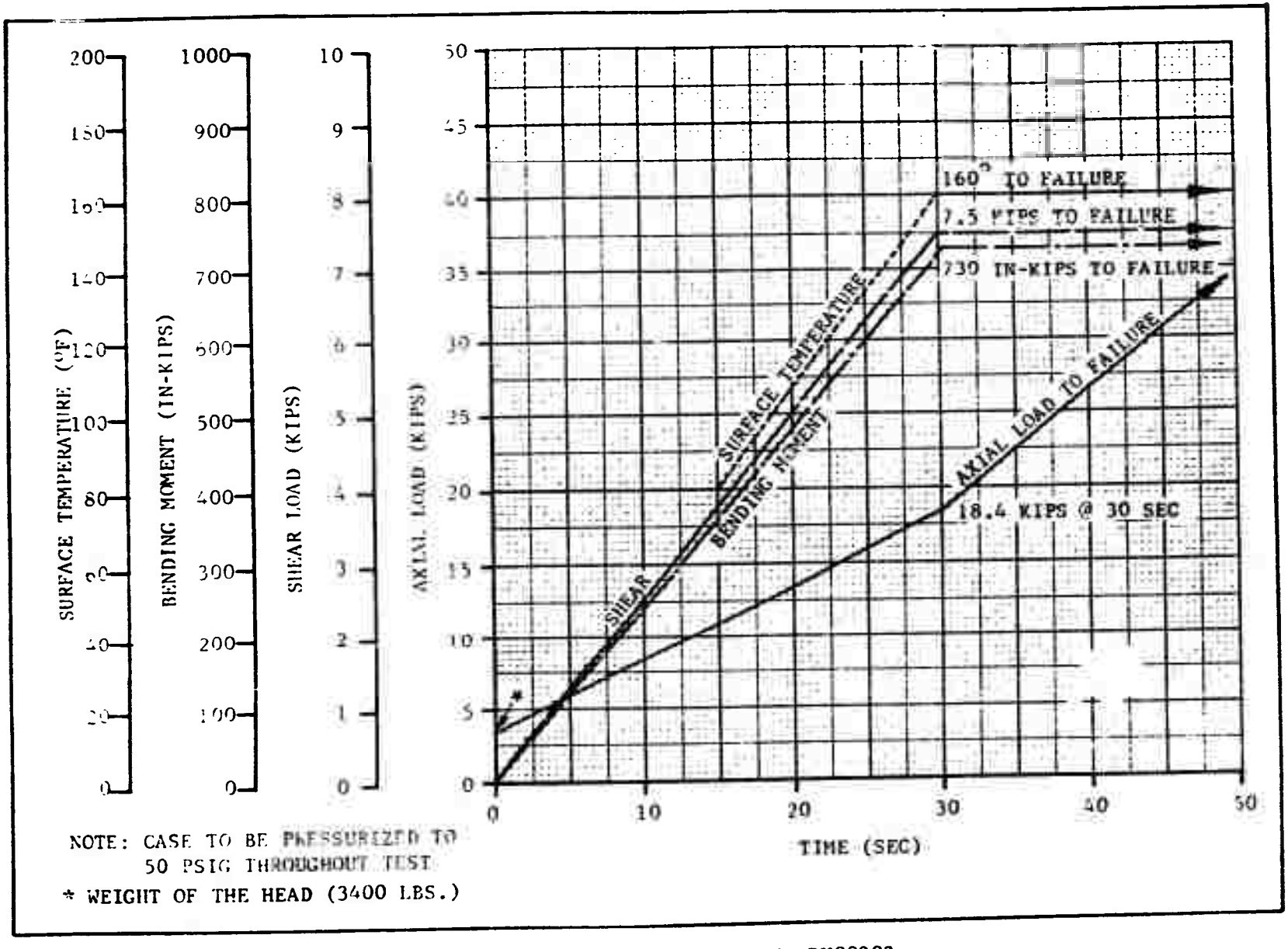


FIGURE 10 Programmed Loads, Phase III, RH00283

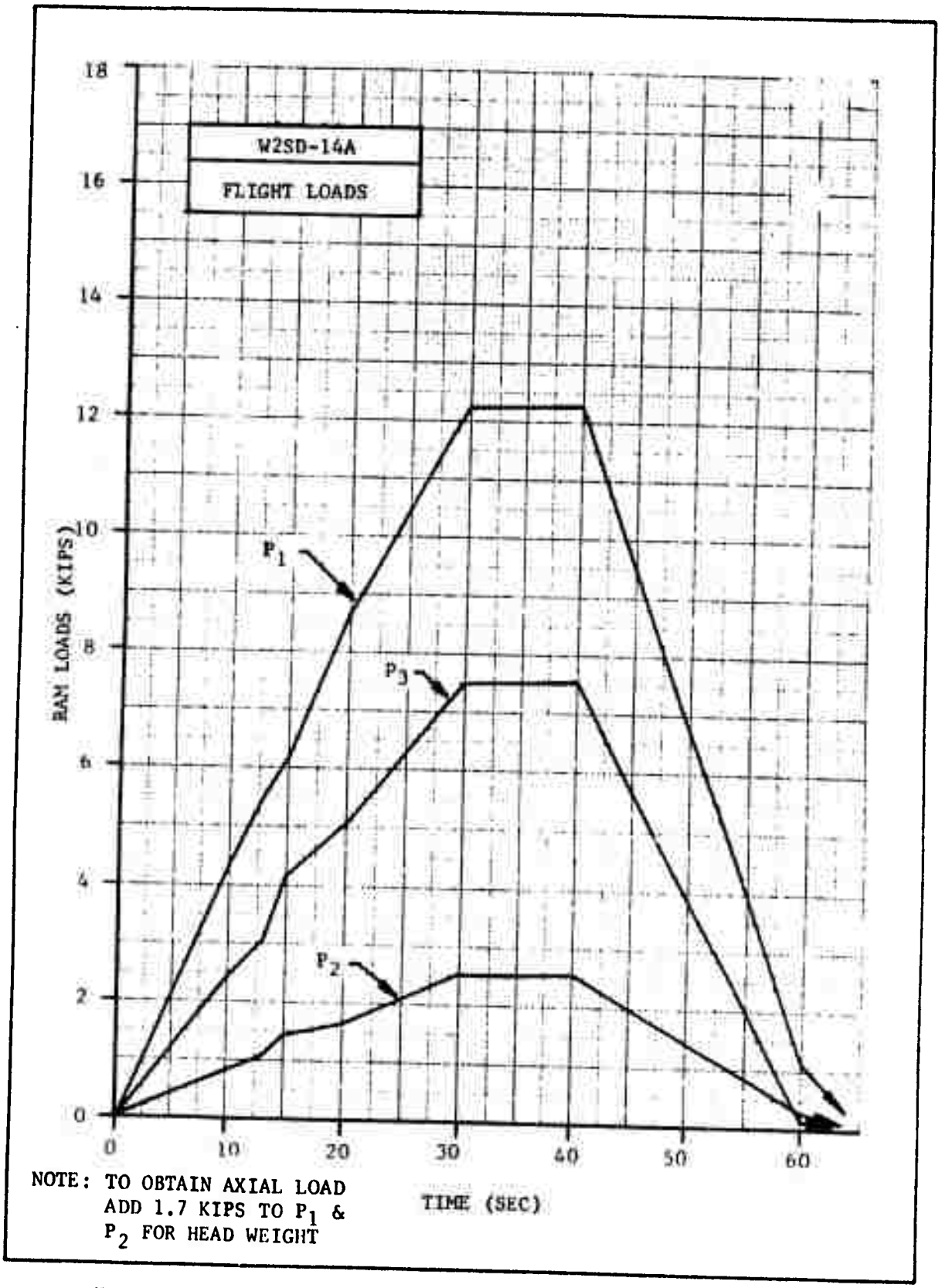


FIGURE 11 Actual Ram Loads, Phase I, W2SD-14A

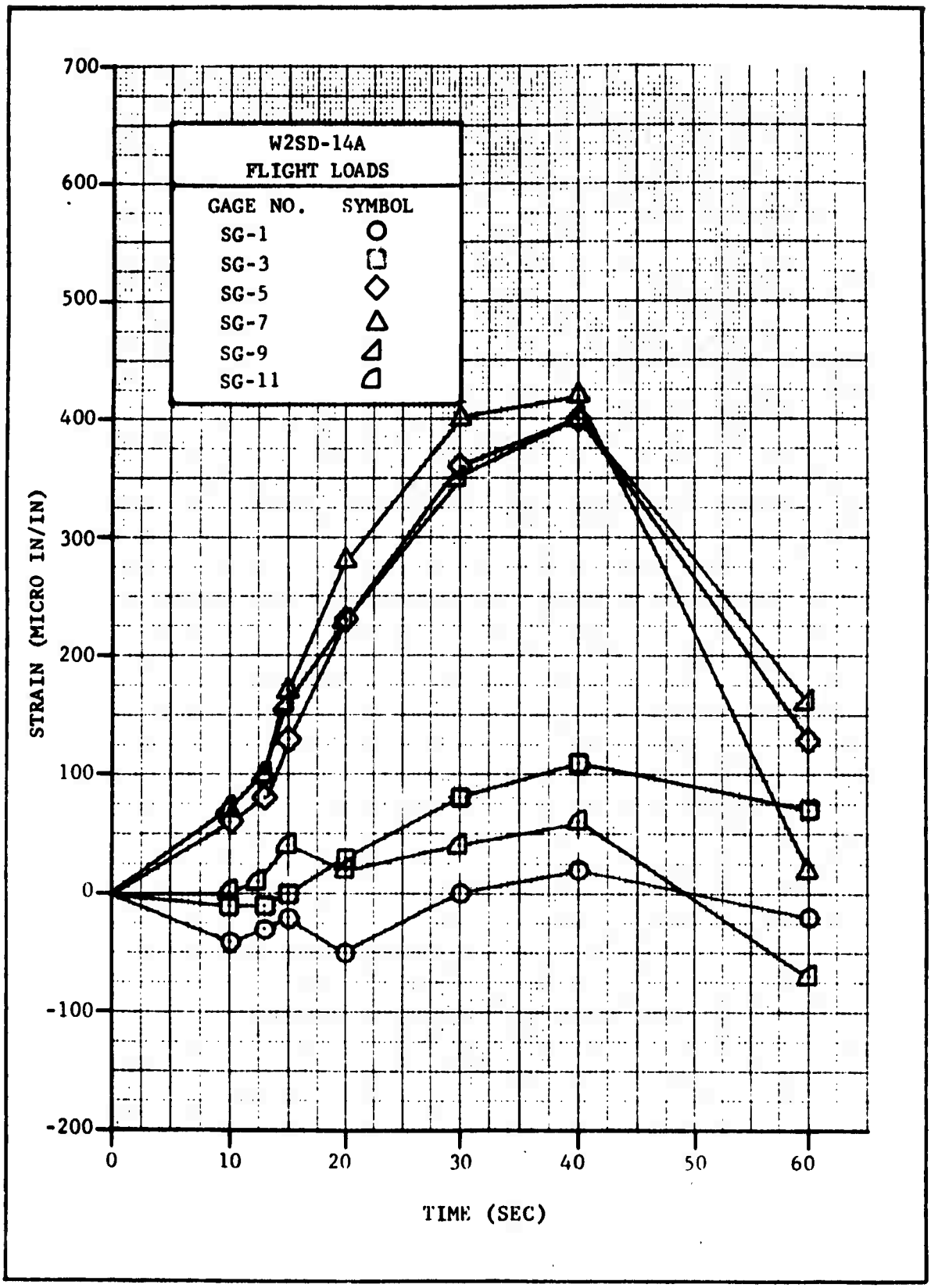


FIGURE 12 Strain Versus Time, Phase I, W2SD-14A, Gages 1, 3, 5, 7, 9 and 11

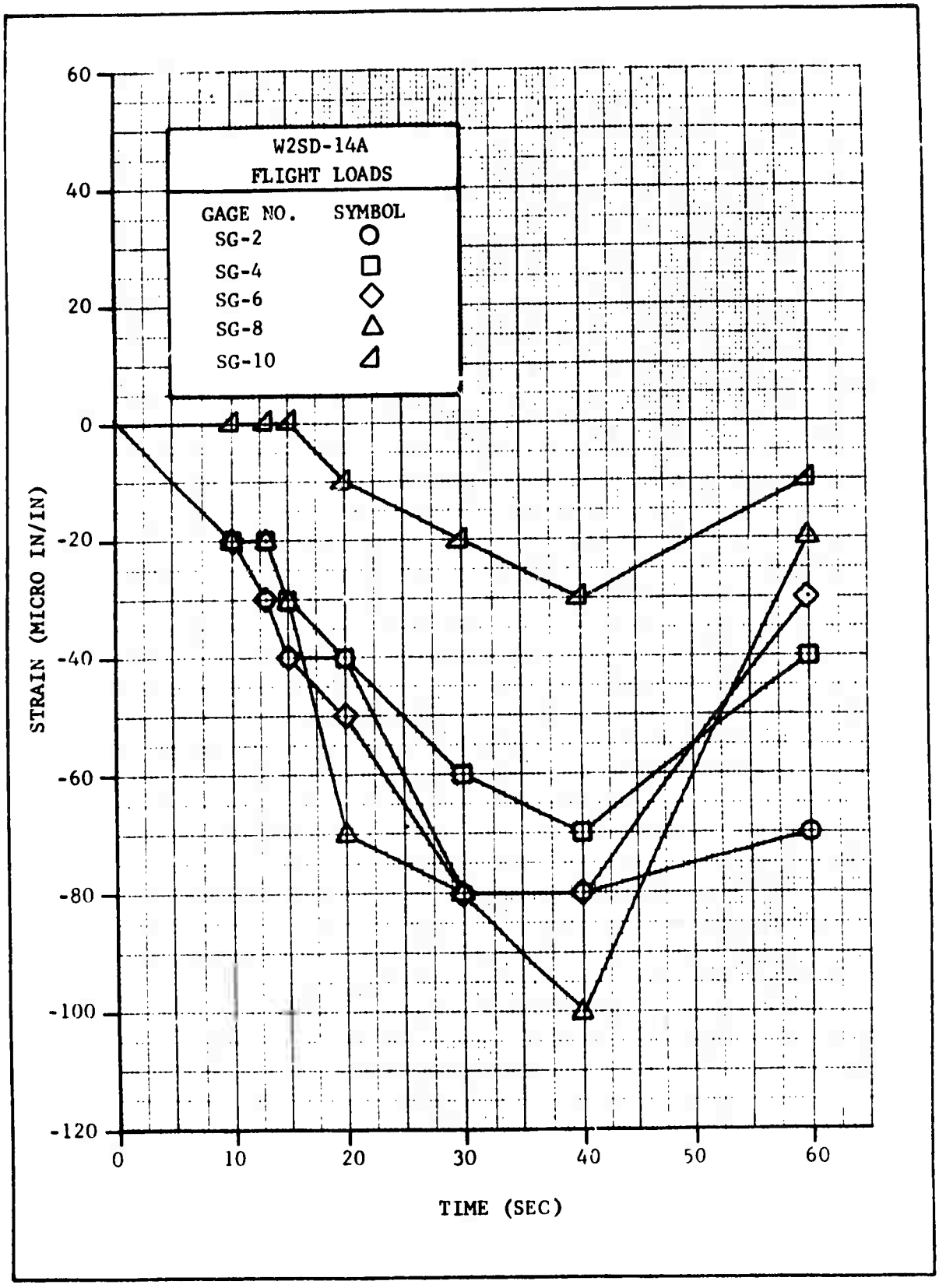


FIGURE 13 Strain Versus Time, Phase I, W2SD-14A, Gages 2, 4, 6, 8 and 10

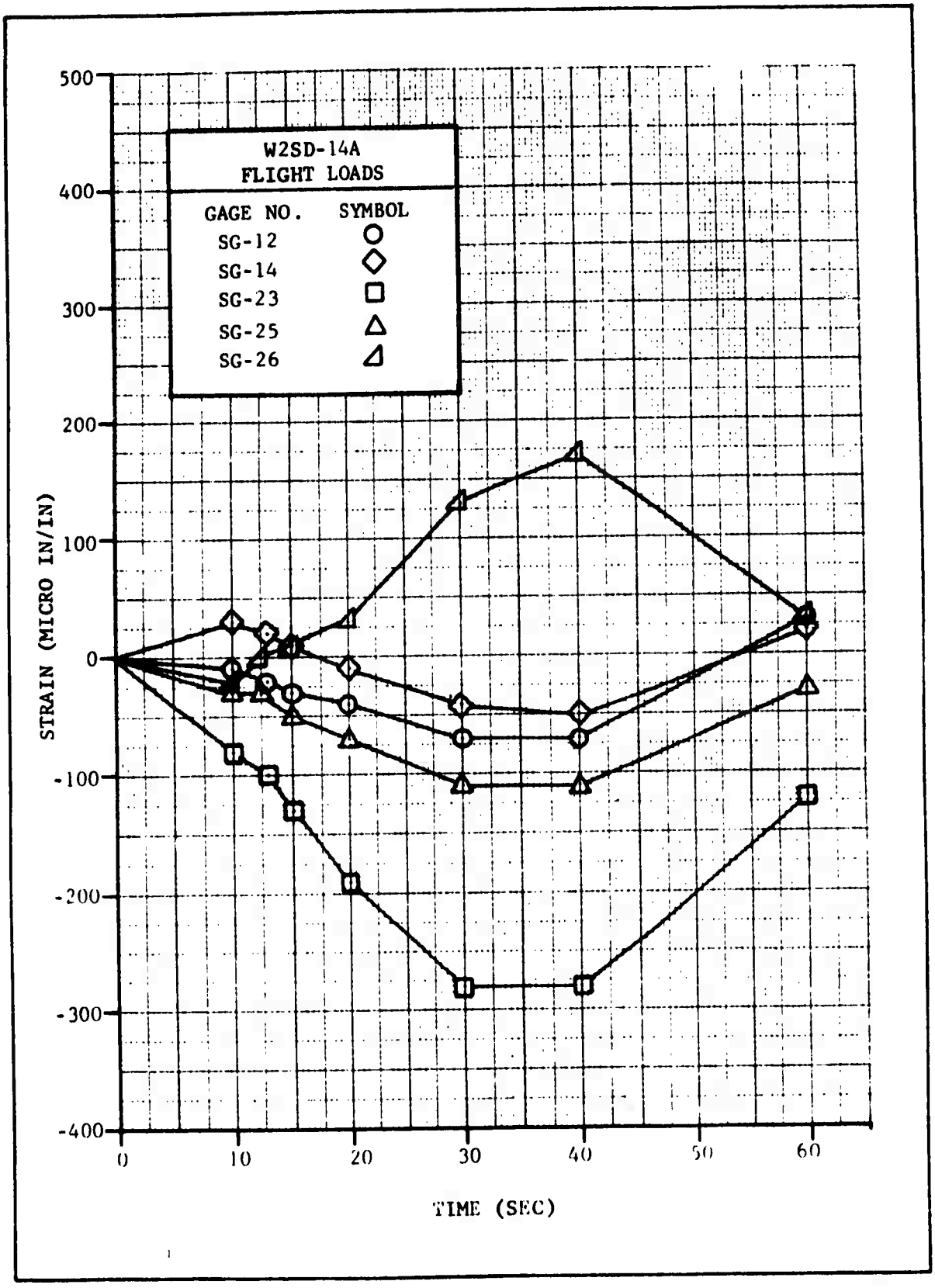


FIGURE 14 Strain Versus Time, Phase I, W2SD-14A, Gages 12, 14, 23, 25 and 26

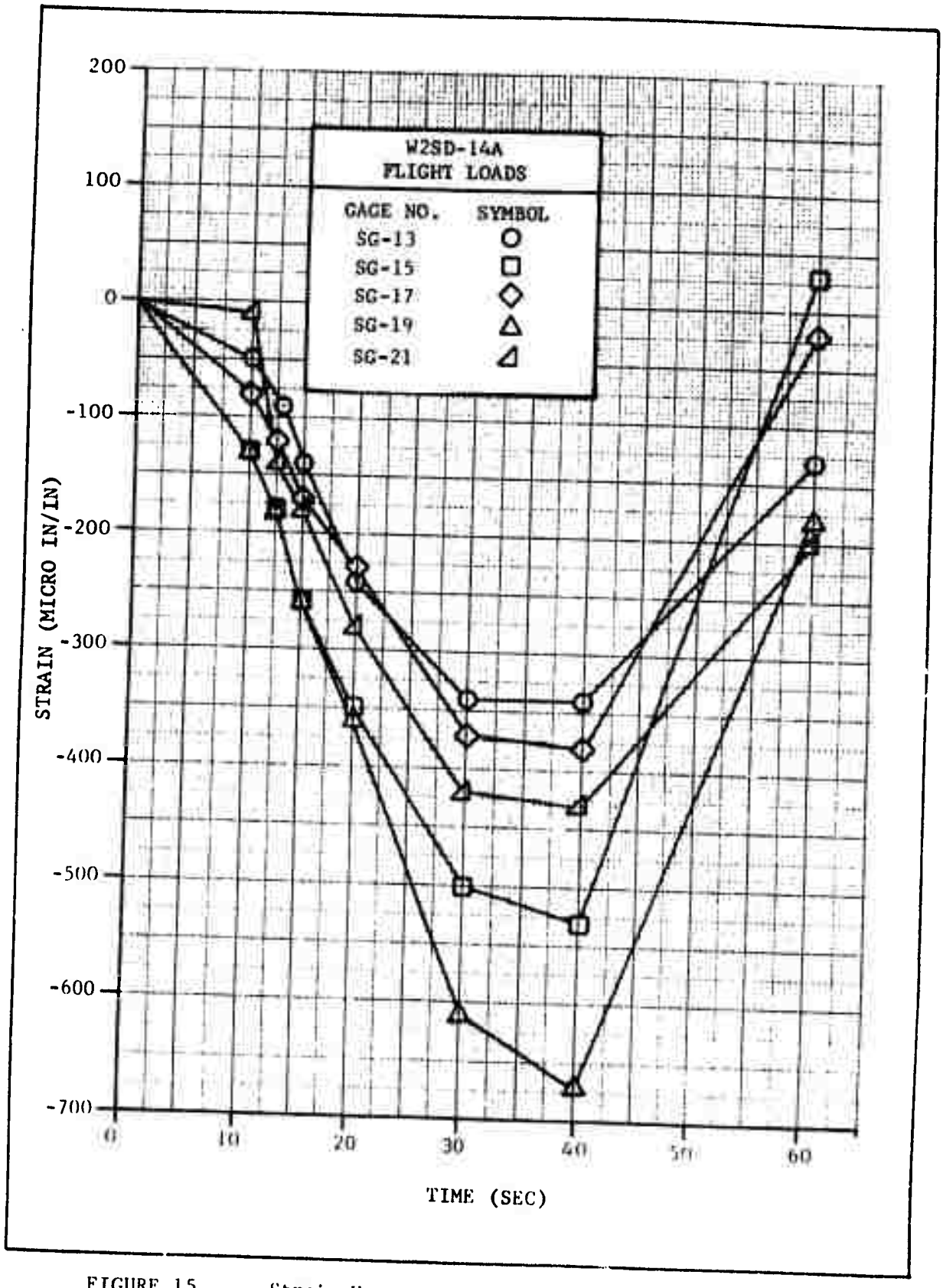


FIGURE 15 Strain Versus Time, Phase I, W2SD-14A, Gages 13, 15, 17, 19 and 21

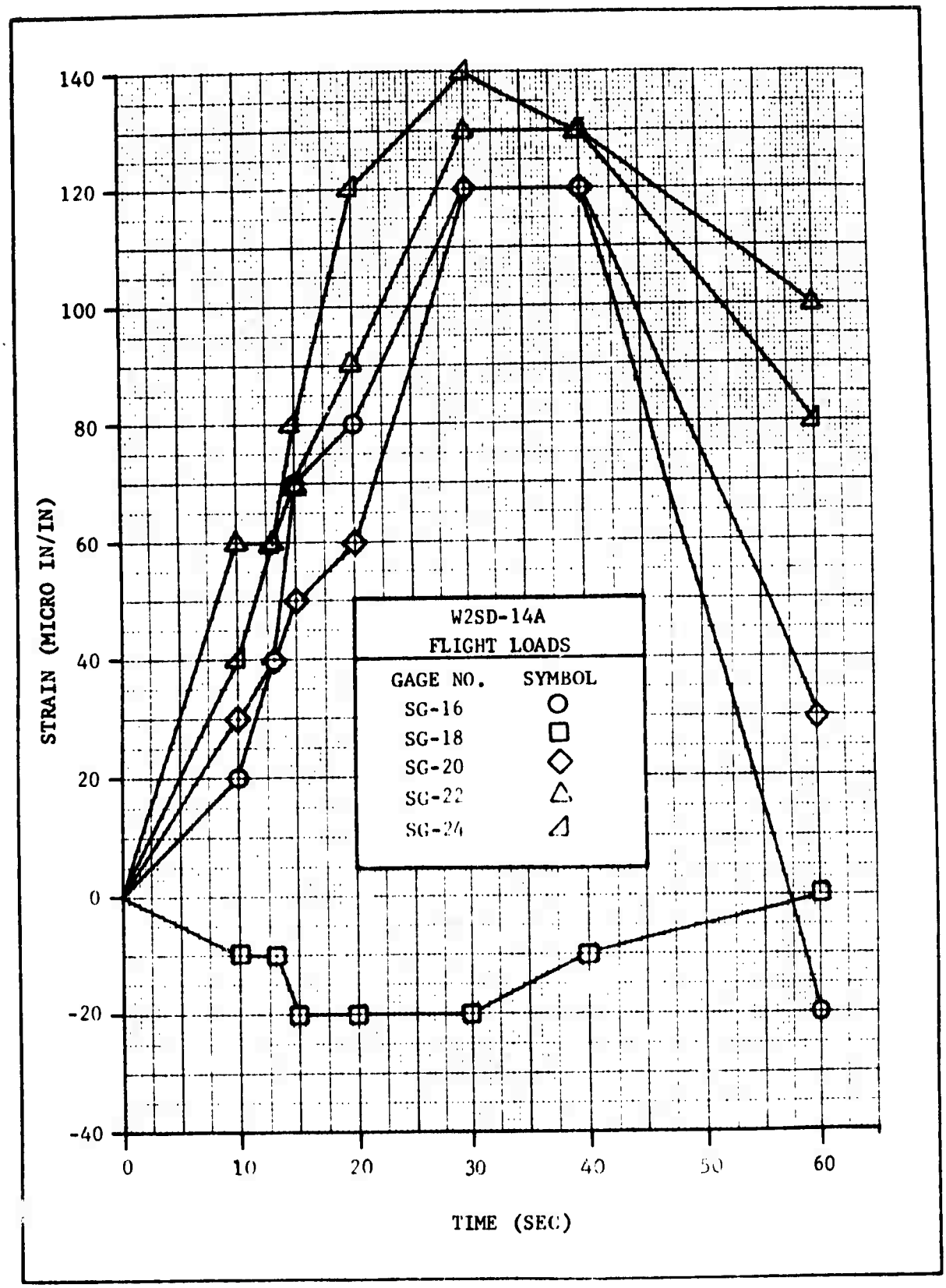


FIGURE 16 Strain Versus Time, Phase I, W2SD-14A, Gages 16, 18, 20, 22 and 24

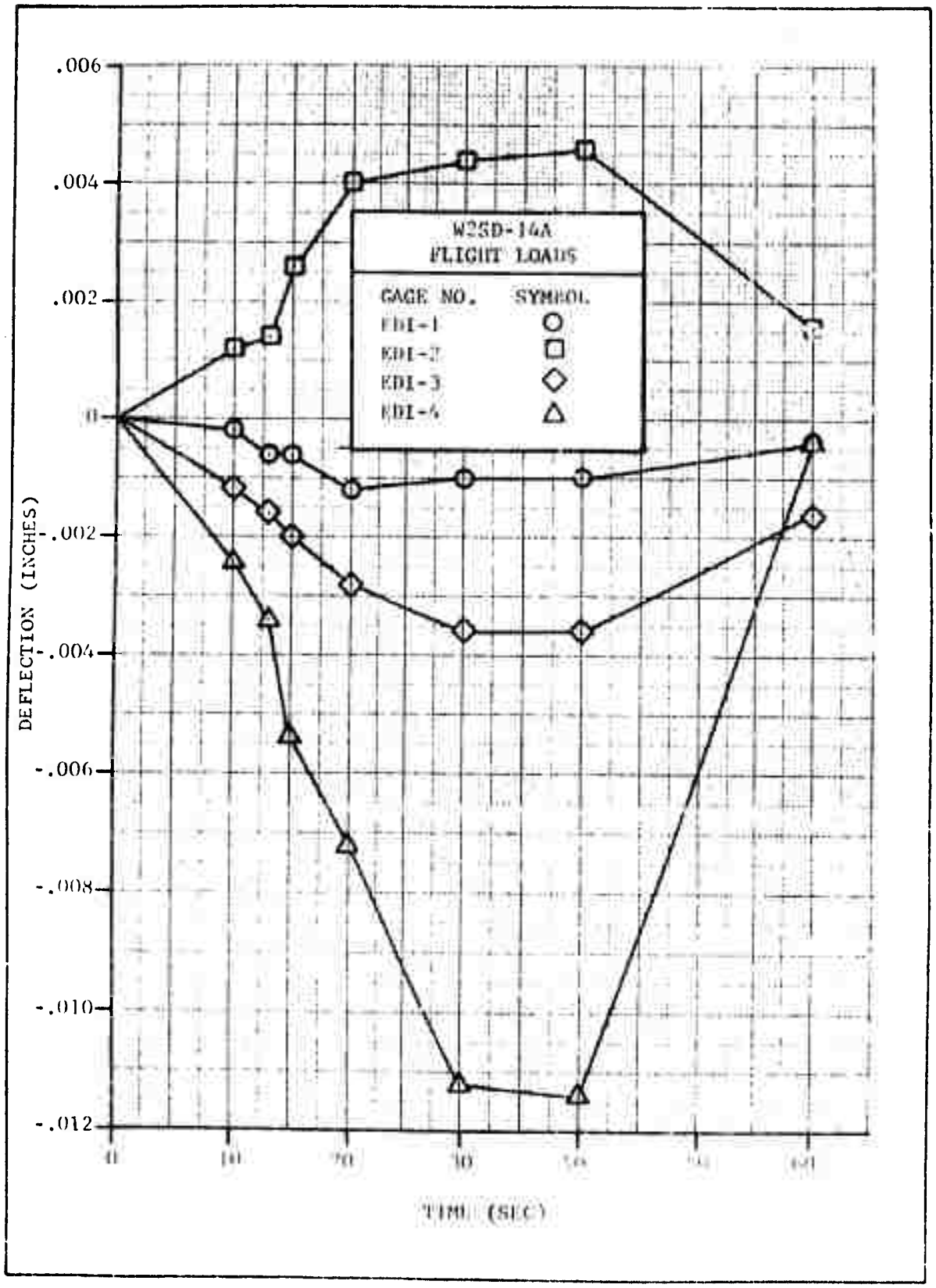


FIGURE 17 Deflection Versus Time, Phase I, W25D-14A, Gages 1, 2, 3, and 4

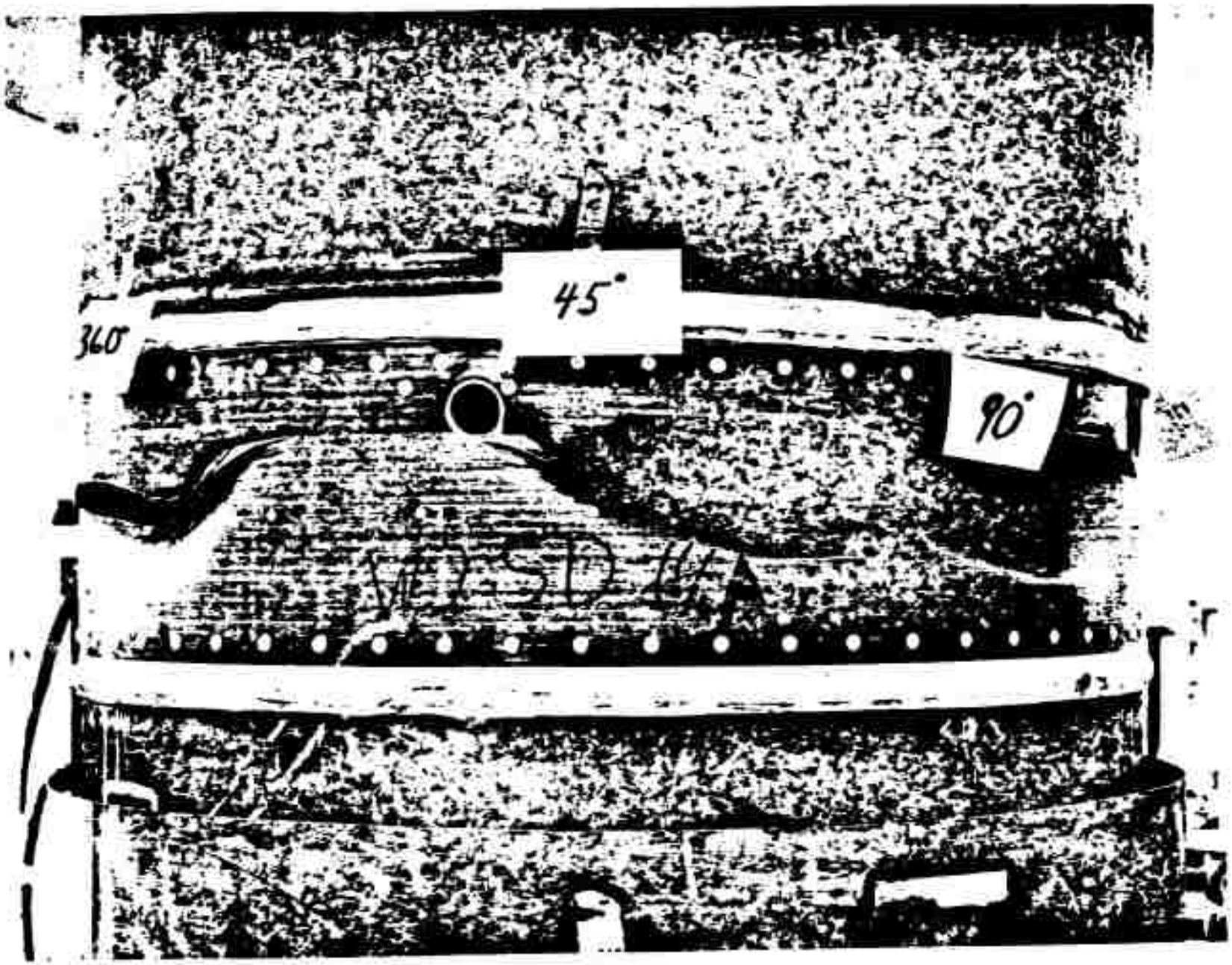


FIGURE 18 Failure Area 45° External, Phase II, W2SD-14A

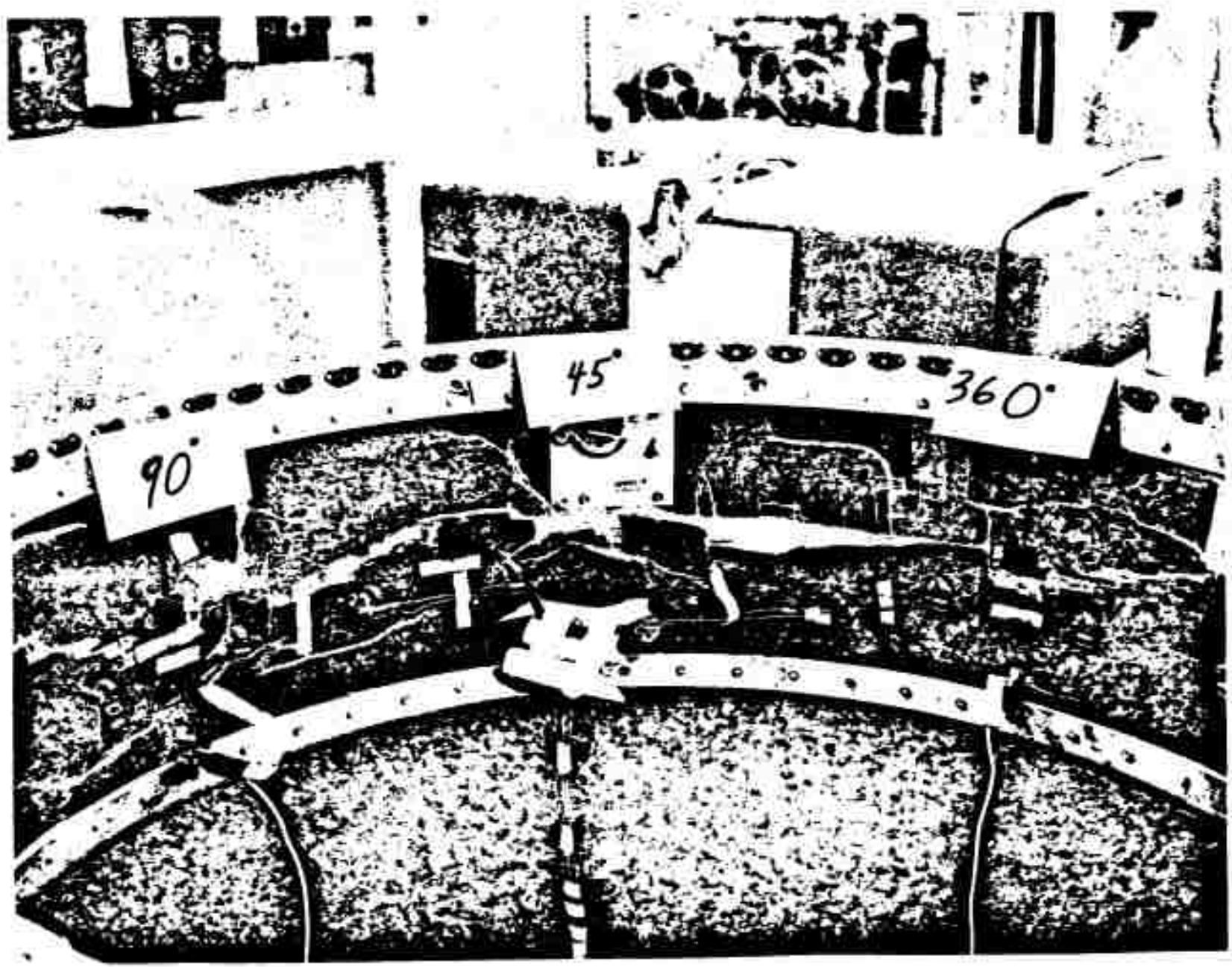


FIGURE 19 Failure Area 45° Internal, Phase II, W2SD-14A

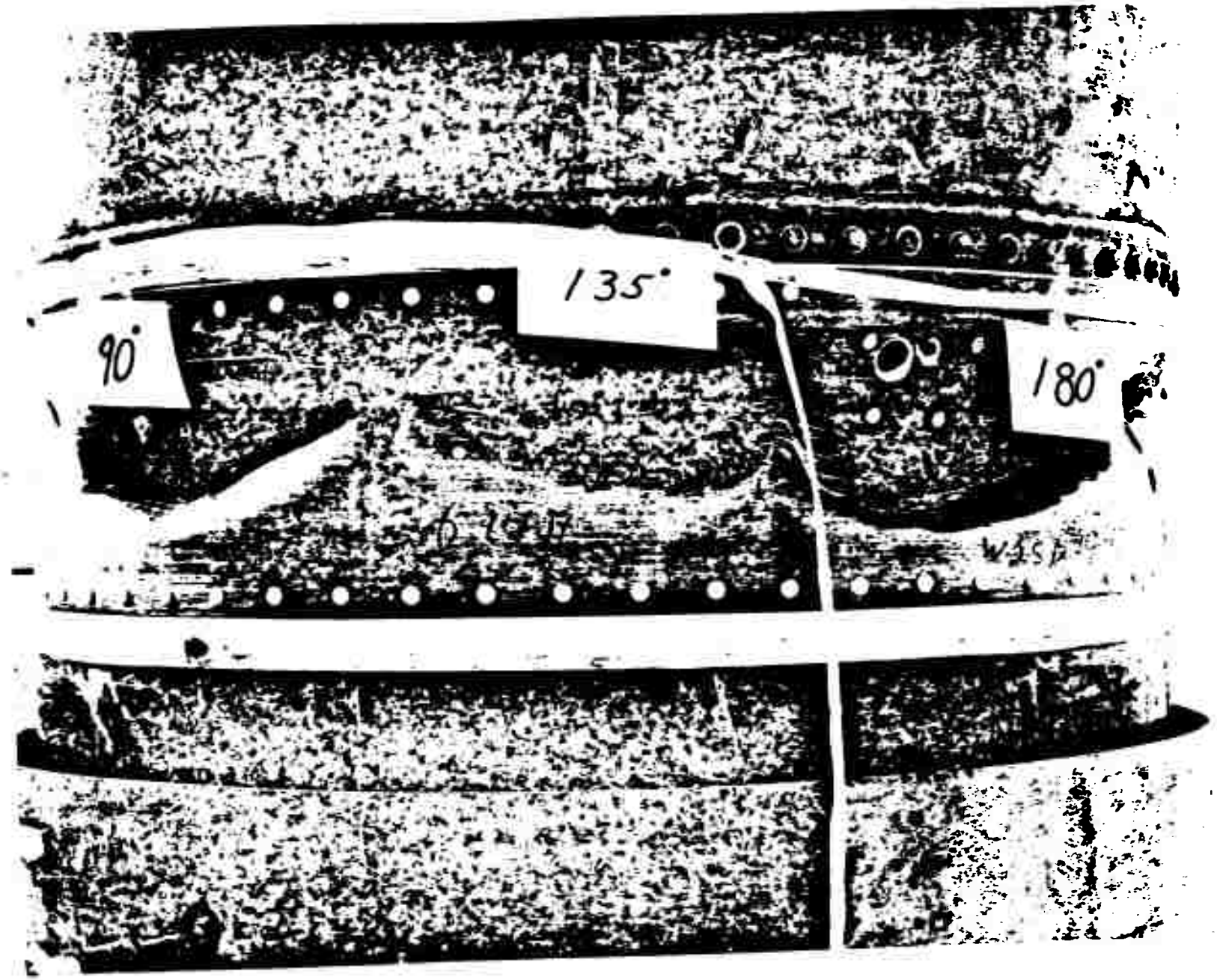


FIGURE 20 Failure Area 135° External, Phase II, W2SD-14A

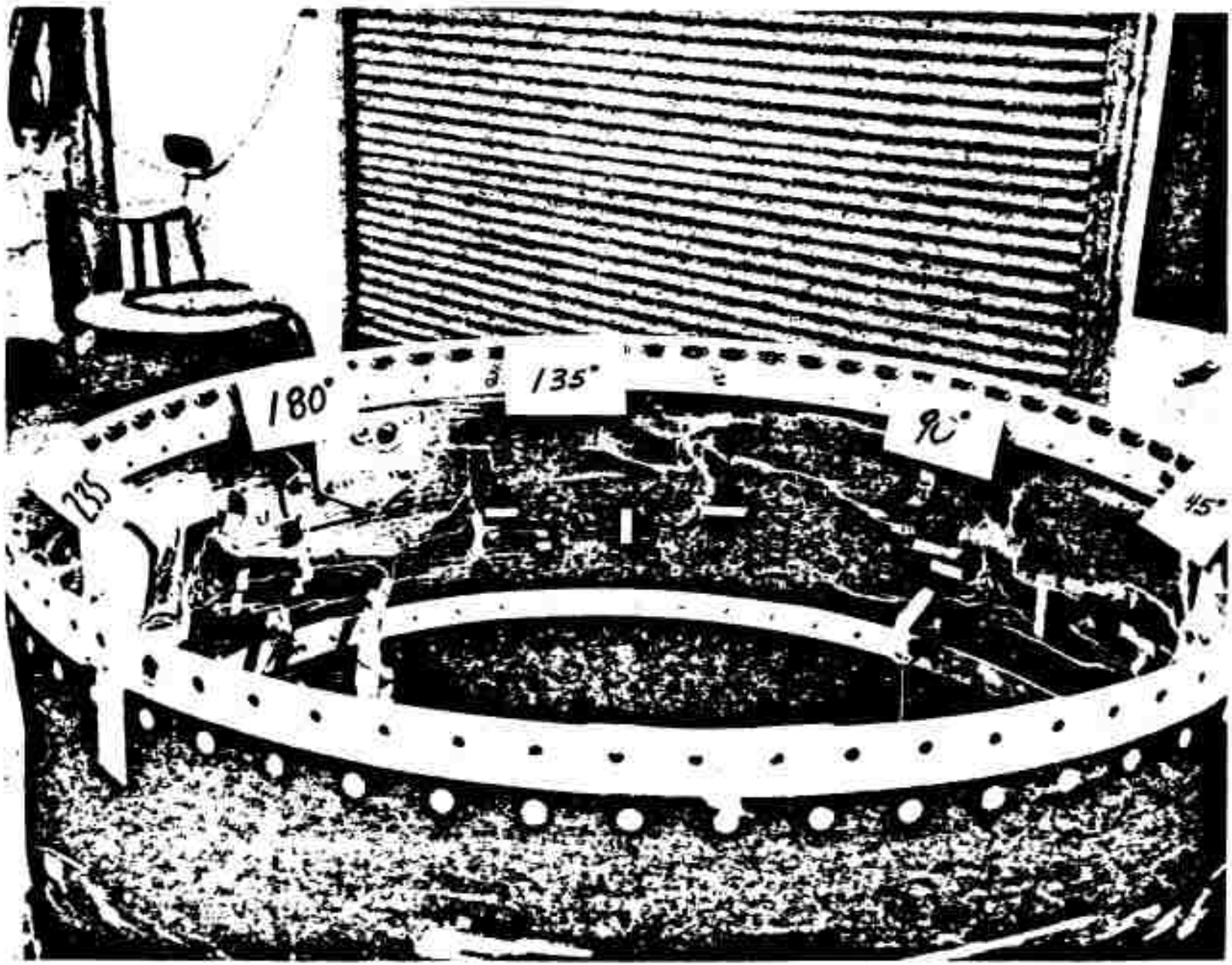


FIGURE 21 Failure Area 135° Internal, Phase II, W2SD-14A

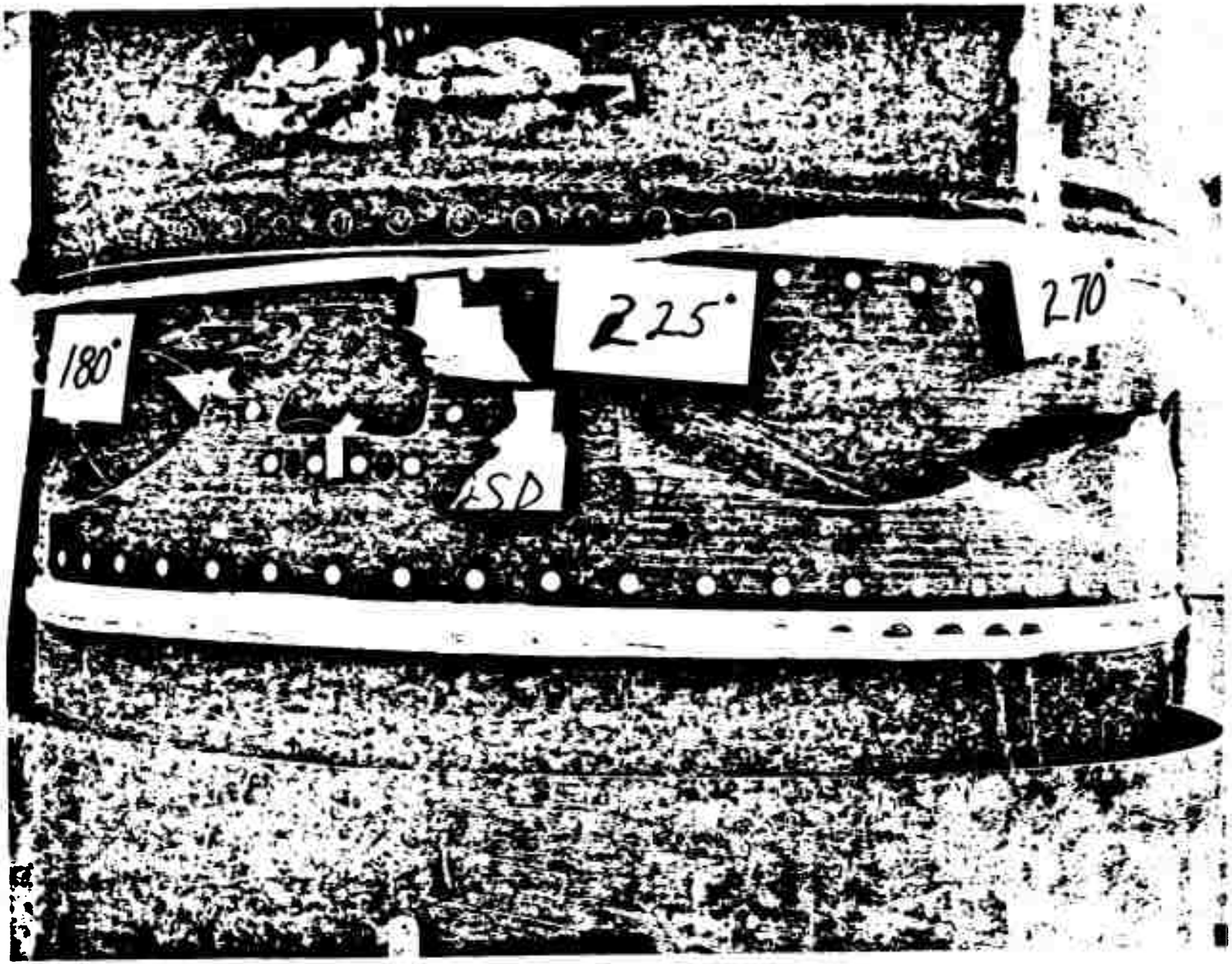


FIGURE 22 Failure Area 225° External, Phase II, W2SD-14A

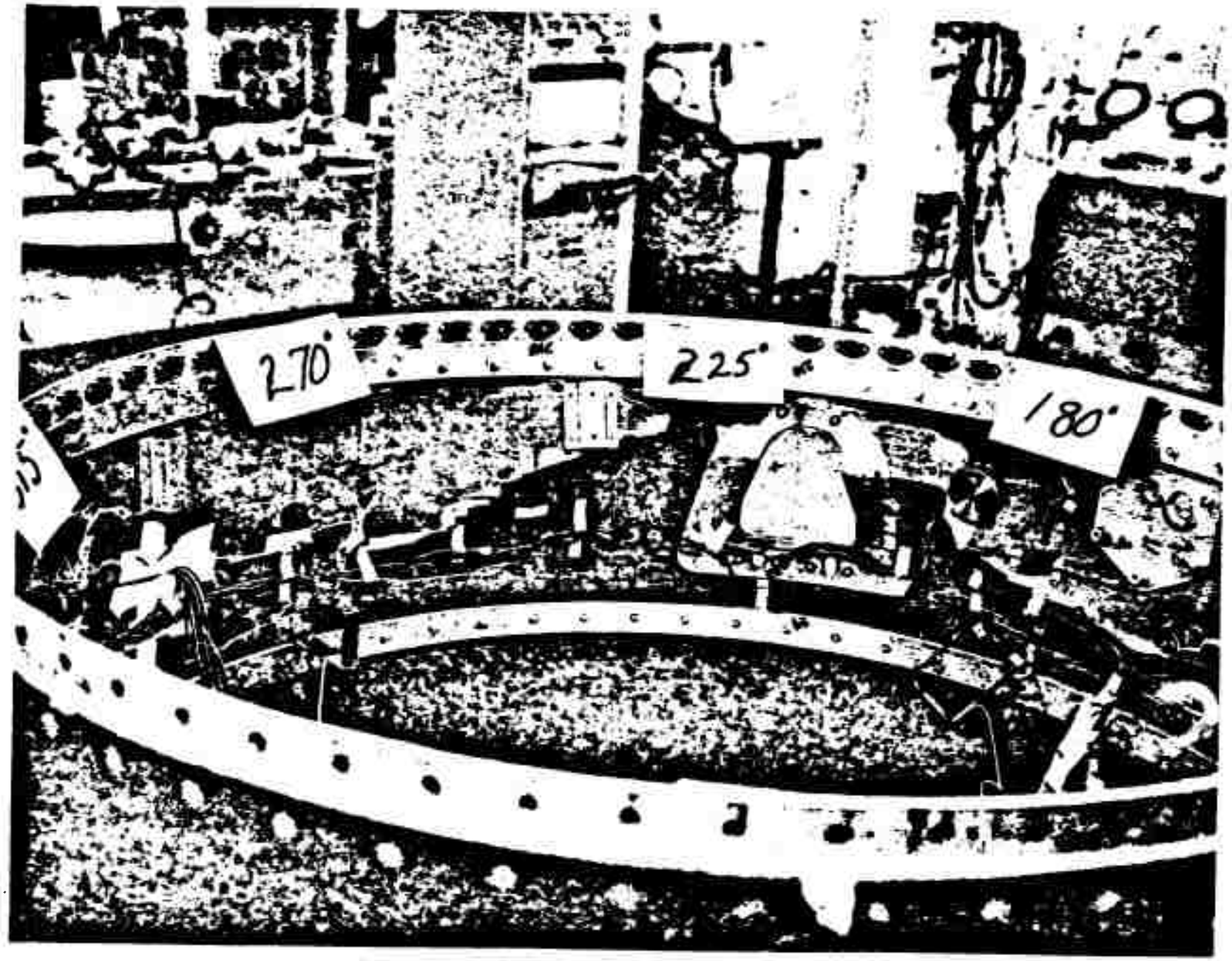


FIGURE 23 Failure Area 225° External, Phase II, W2SD-14A

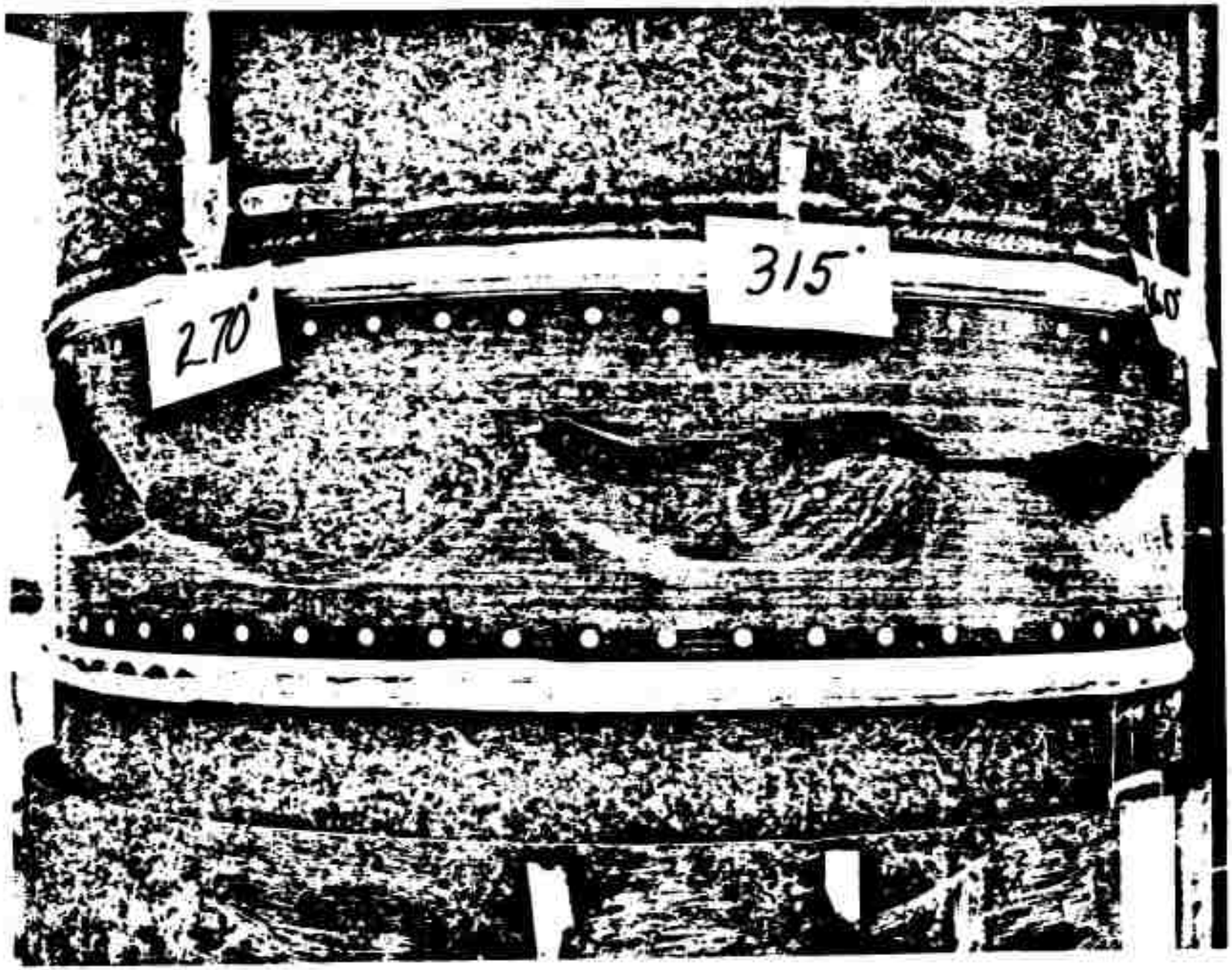


FIGURE 24 Failure Area 315° External, Phase II, W2SD-14A

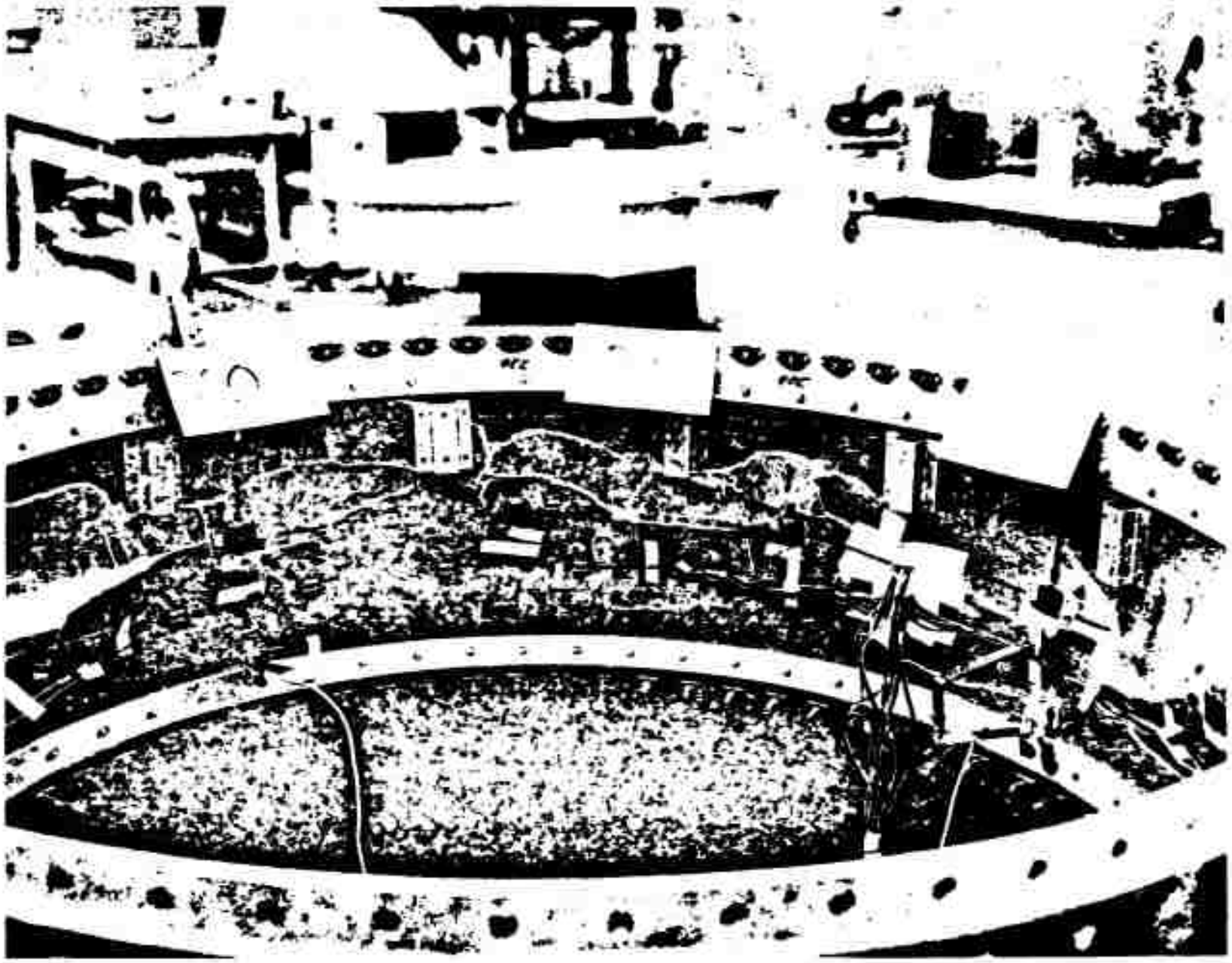


FIGURE 25 Failure Area 315° Internal, Phase II, W2SD-14A

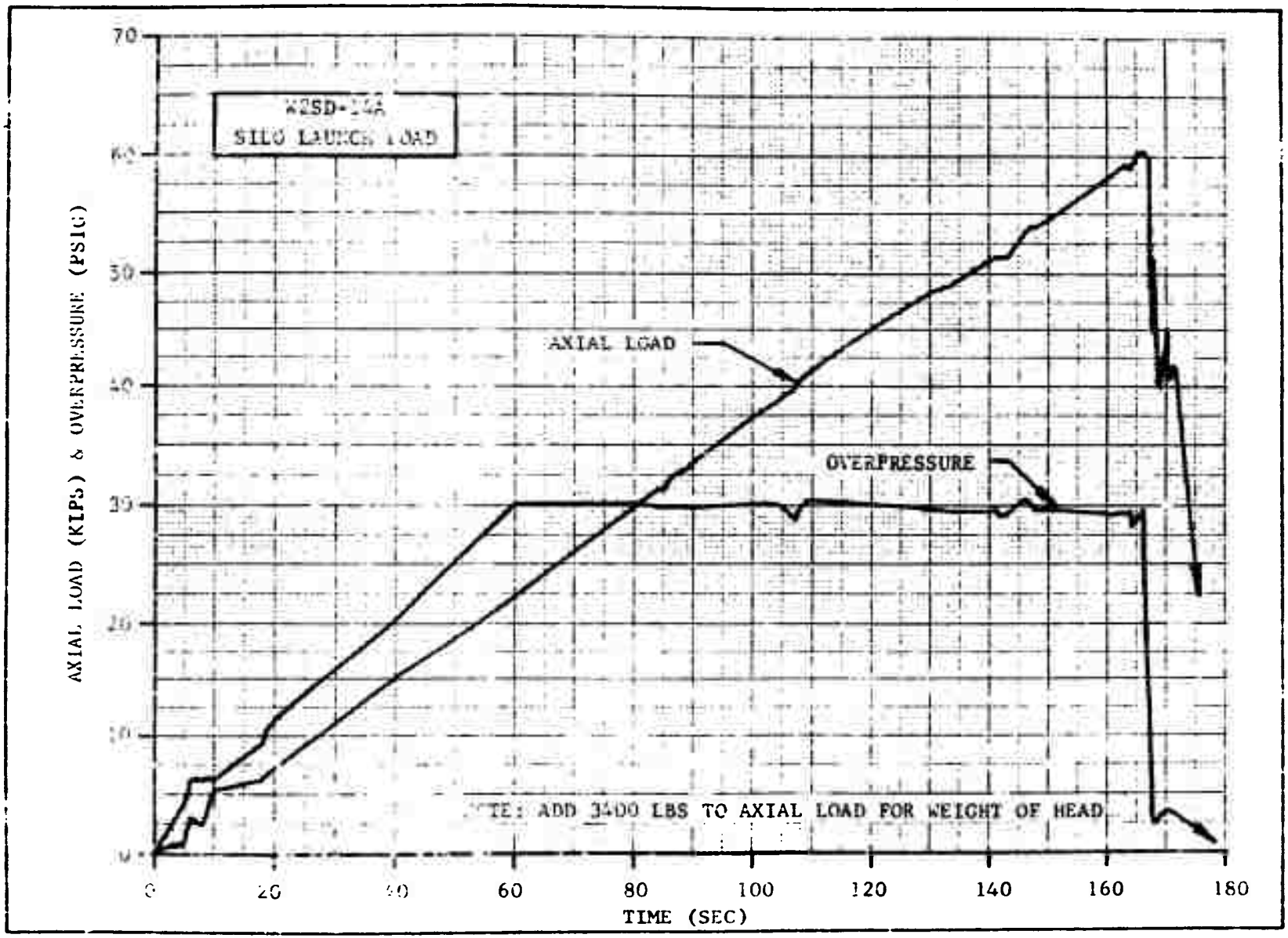


FIGURE 26 Actual Loads, Phase II, W2SD-14A

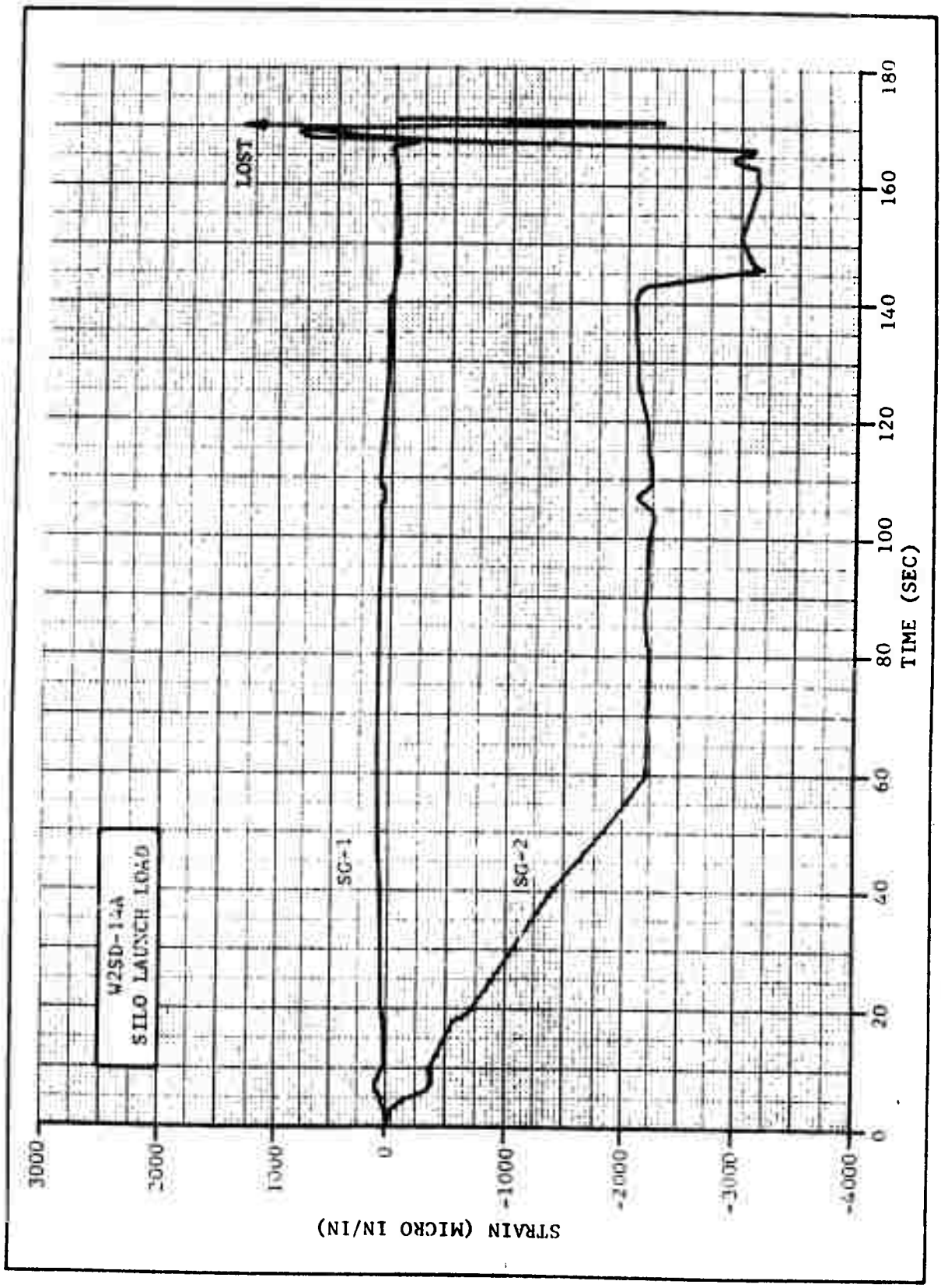


FIGURE 27 Strain Versus Time, Phase II, W2SD-14A, Gages 1 and 2

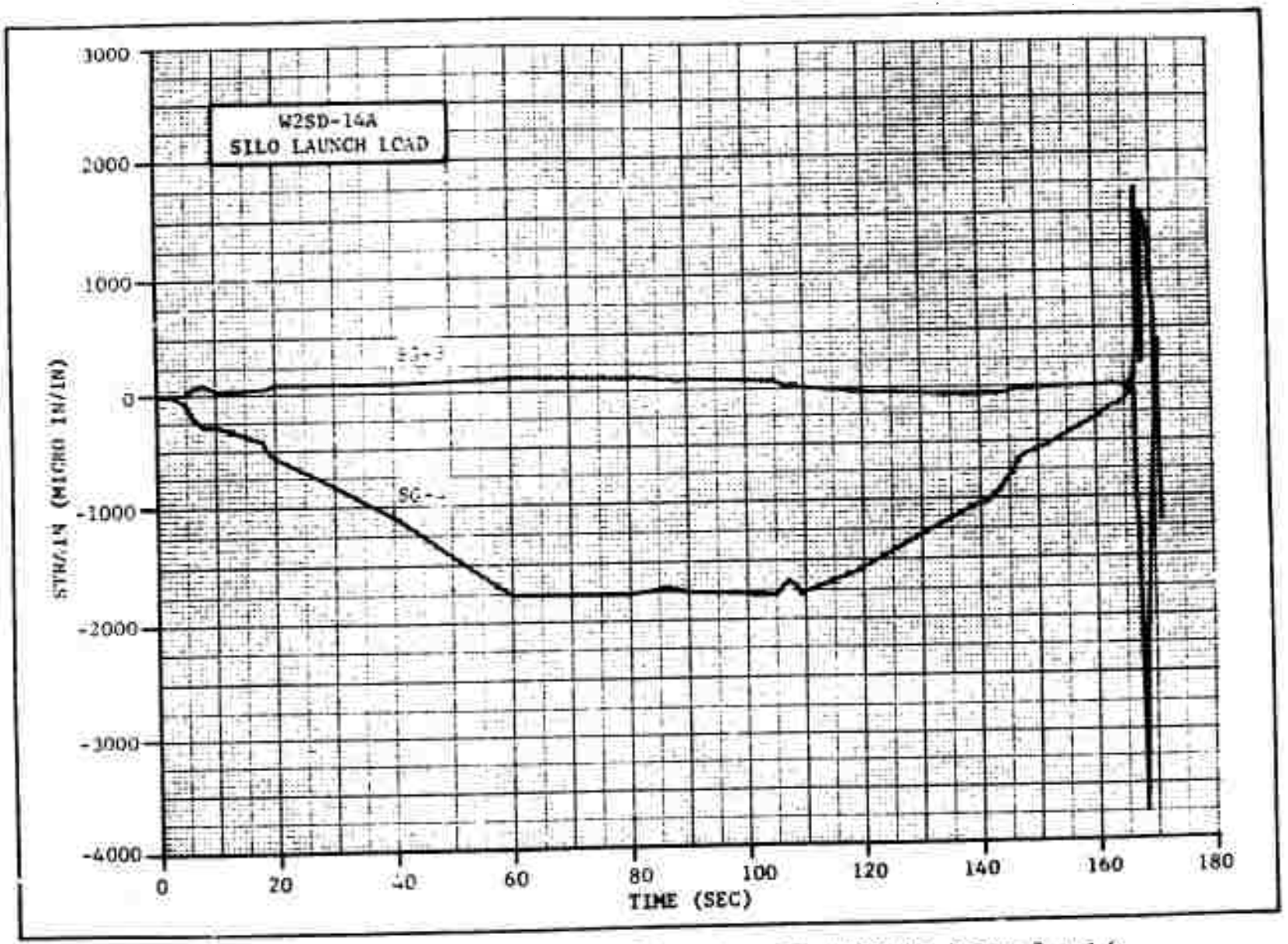


FIGURE 2b Strain Versus Time, Phase II, W2SD-14A, Gages 3 and 4

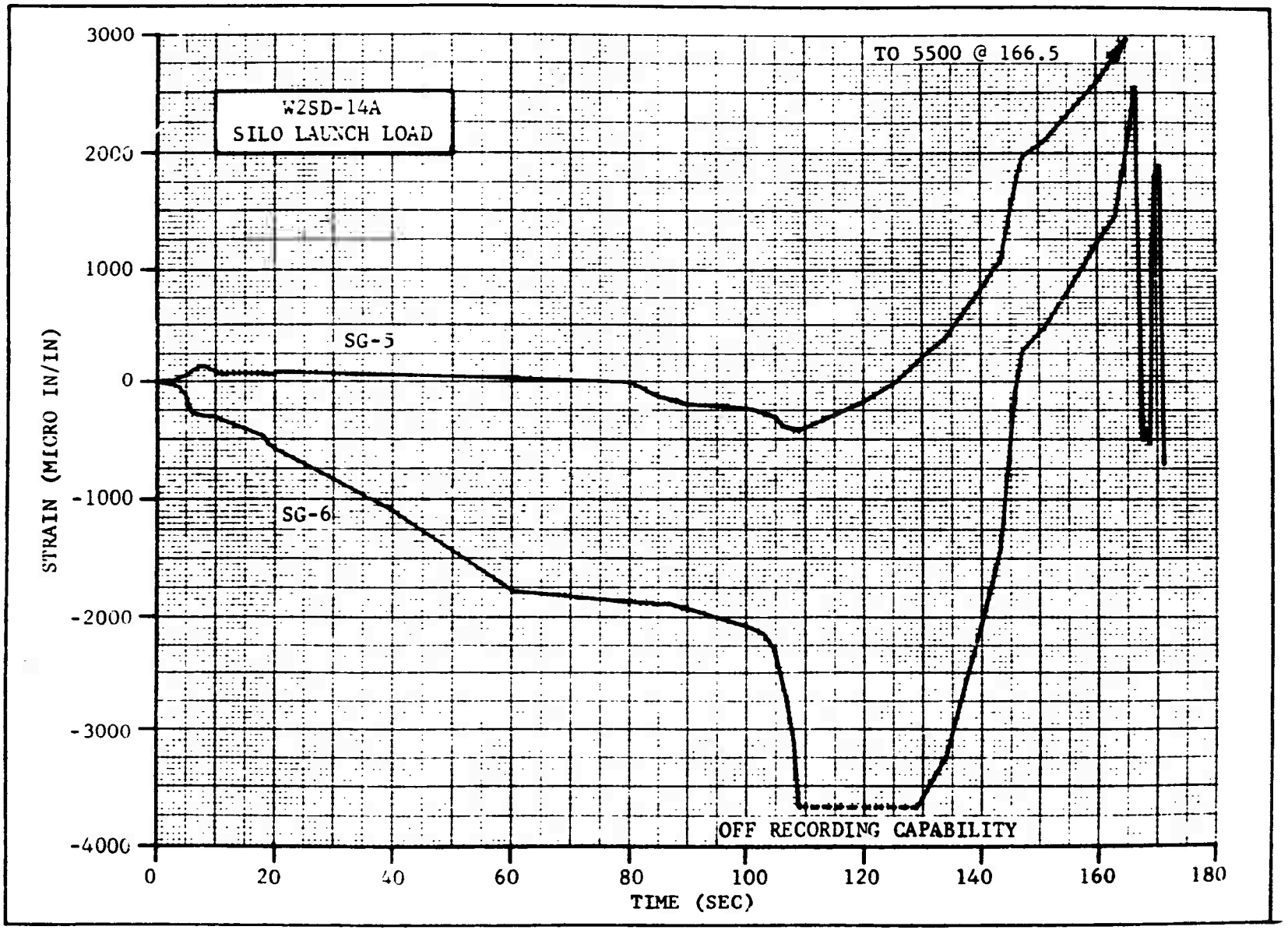


FIGURE 29 Strain Versus Time, Phase II, W2SD-14A, Gages 5 and 6

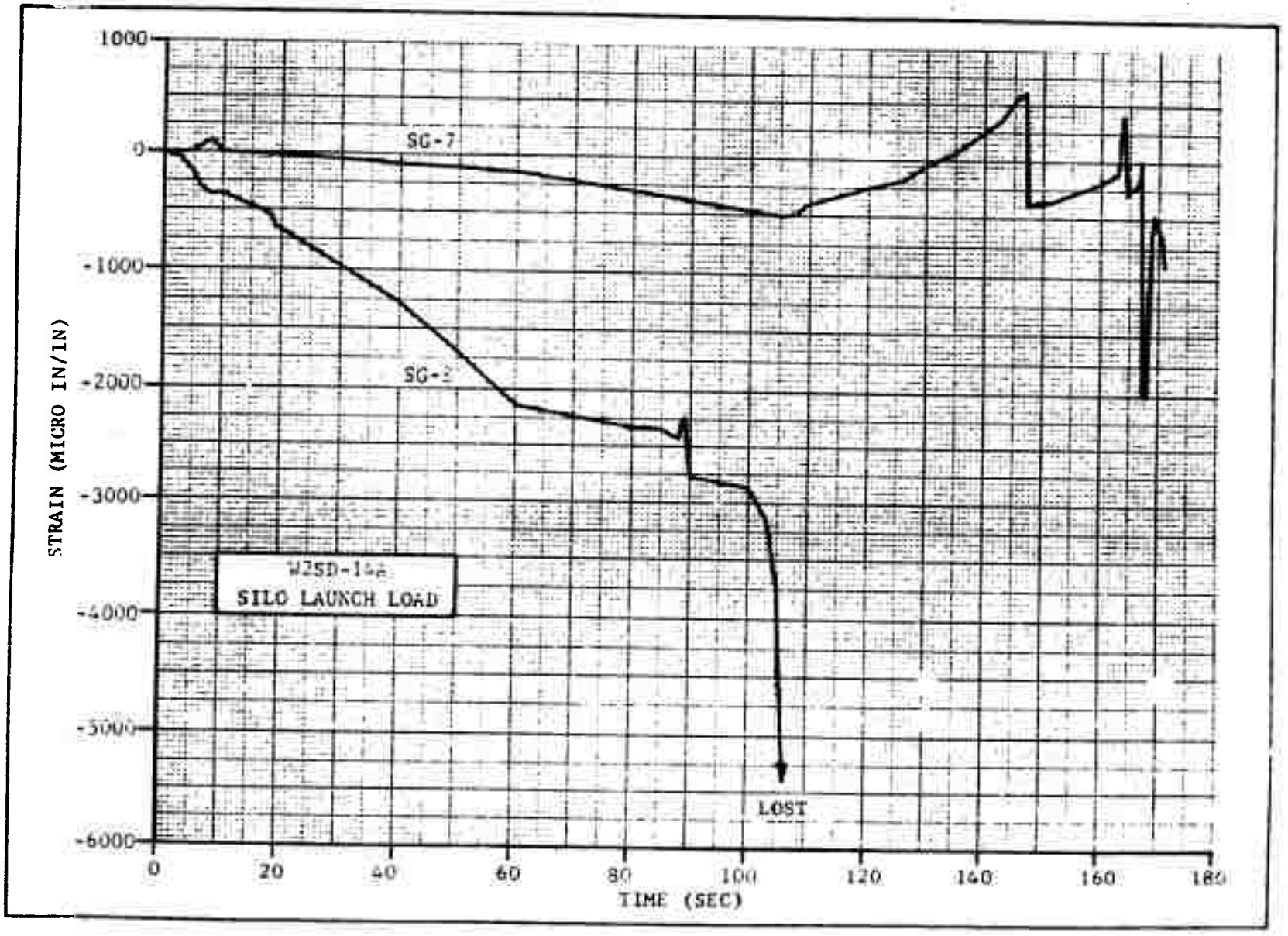


FIGURE 30 Strain Versus Time, Phase II, W2SD-14A, Gages 7 and 8

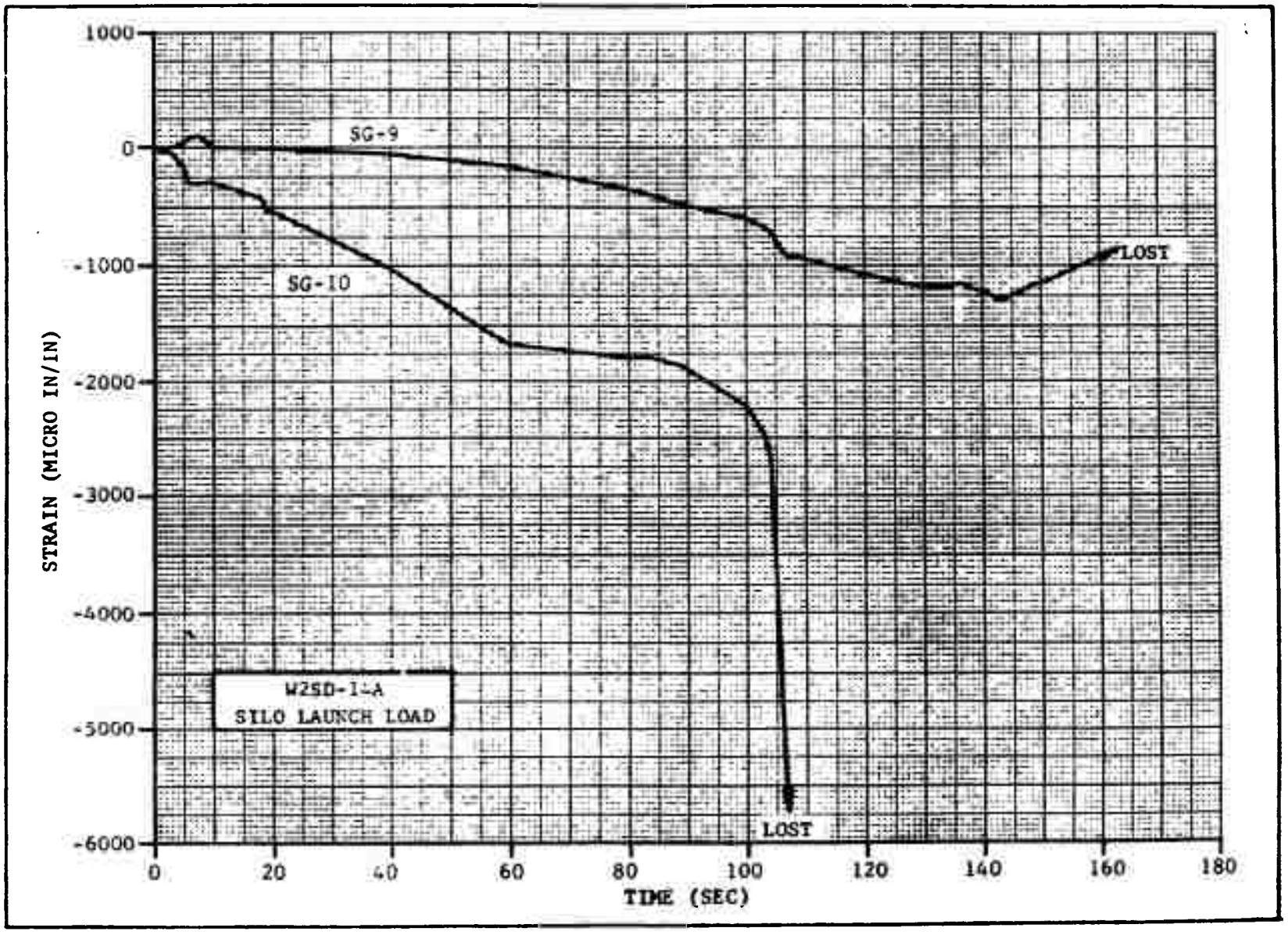


FIGURE 31 Strain Versus Time, Phase II, W2SD-14A, Gages 9 and 10

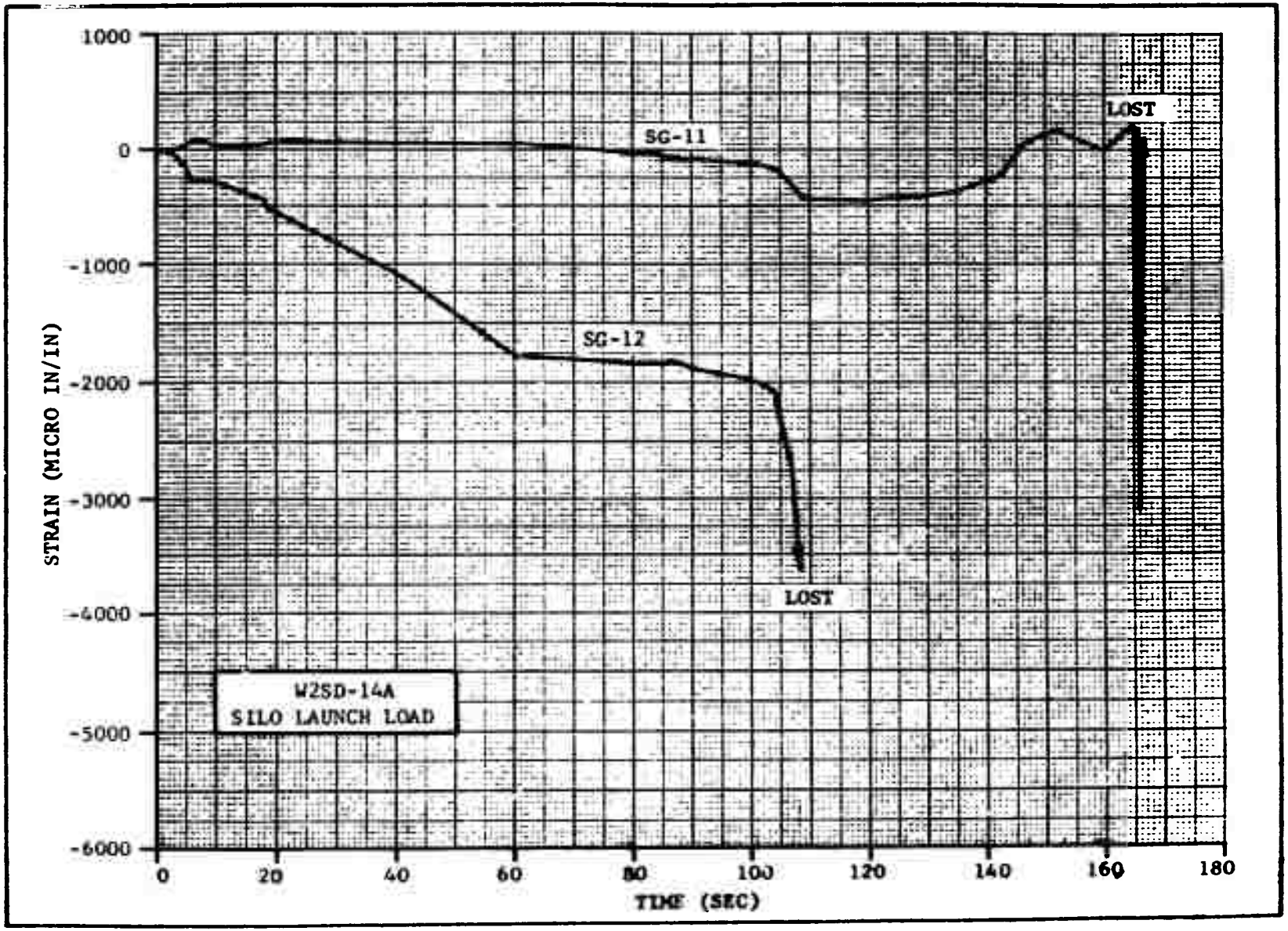


FIGURE 32 Strain Versus Time, Phase II, W2SD-14A, Gages 11 and 12

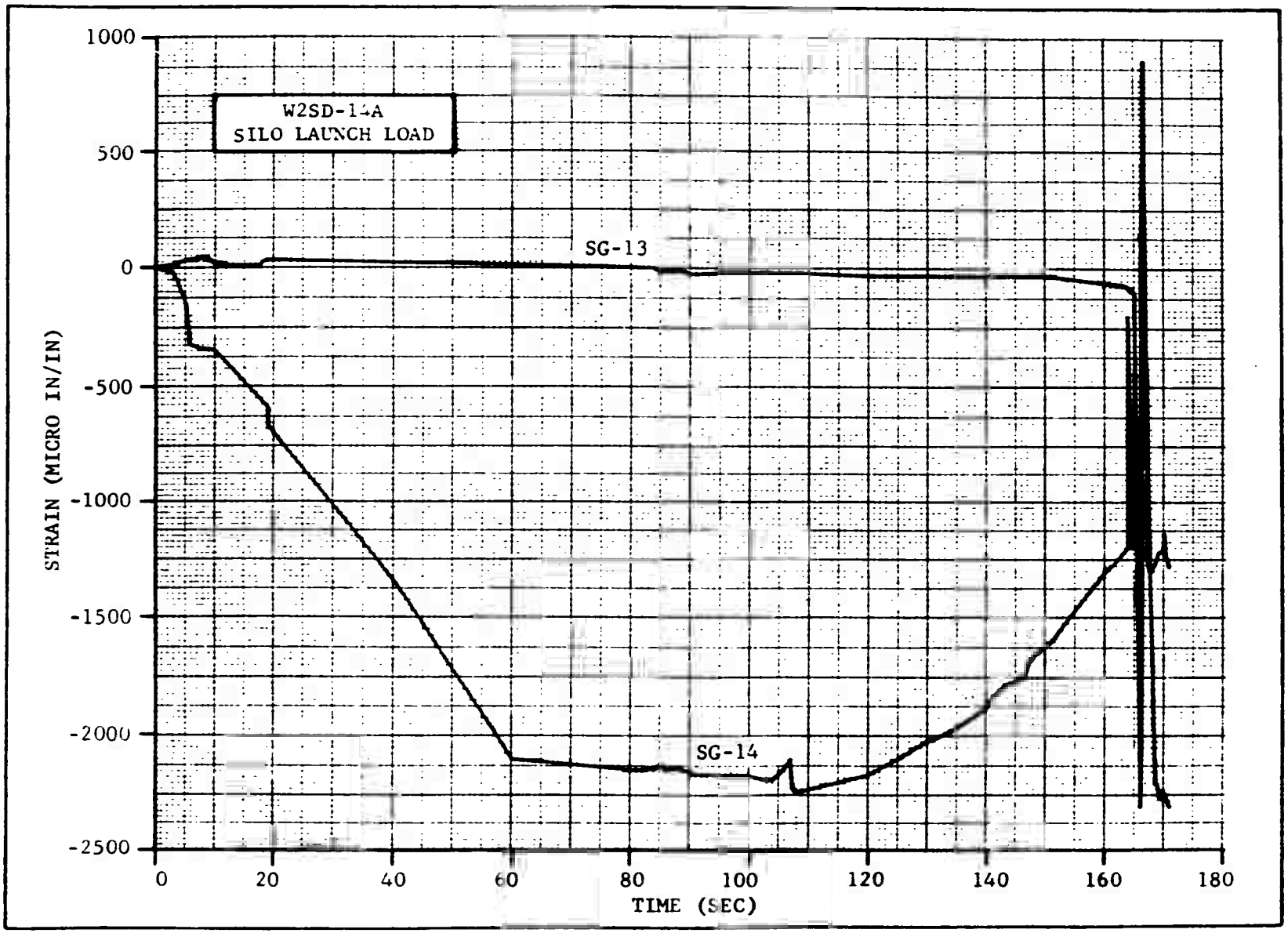


FIGURE 33 Strain Versus Time, Phase II, W2SD-14A, Gages 13 and 14

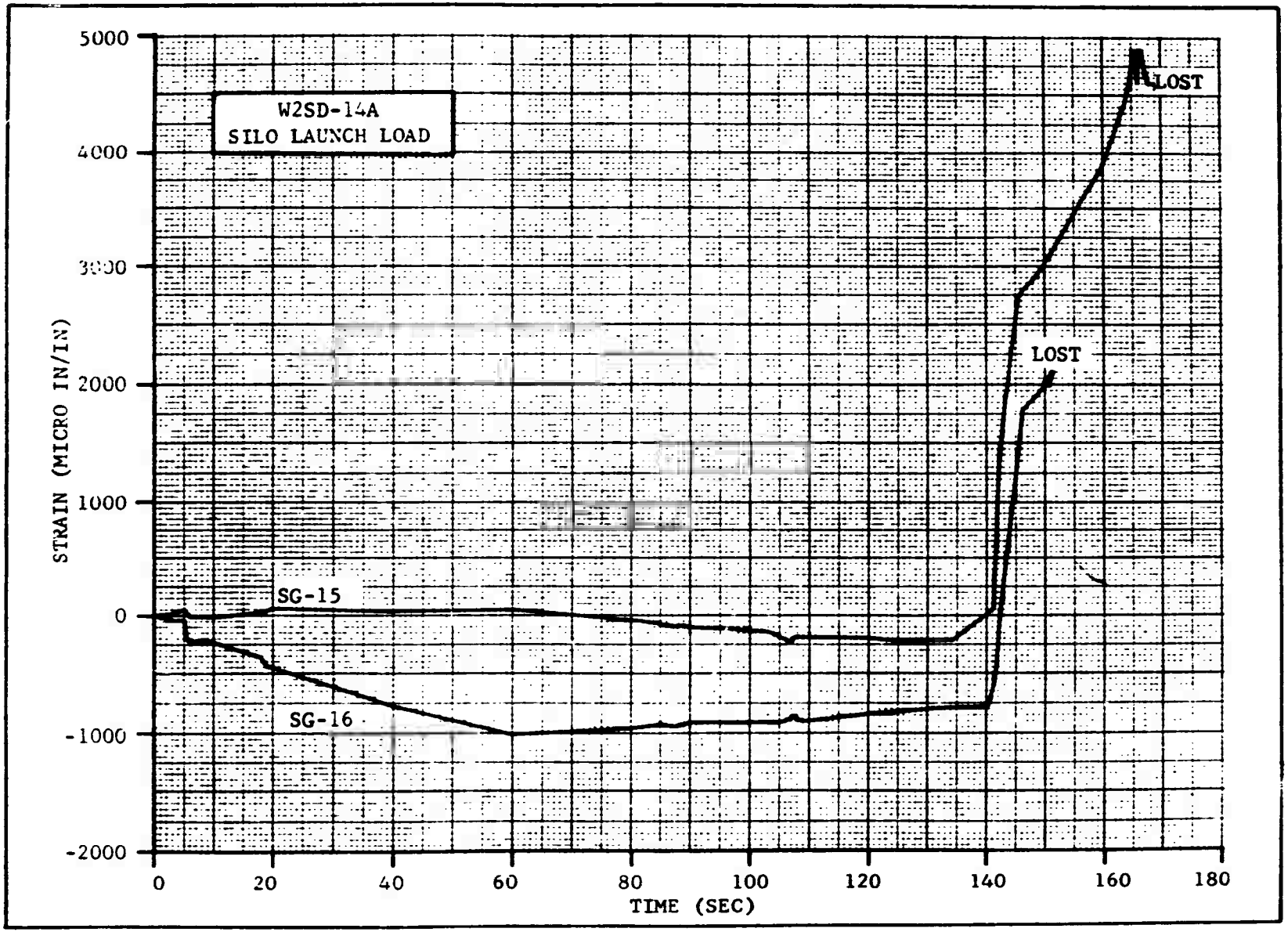


FIGURE 34 Strain Versus Time, Phase II, W2SD-14A, Gages 15 and 16

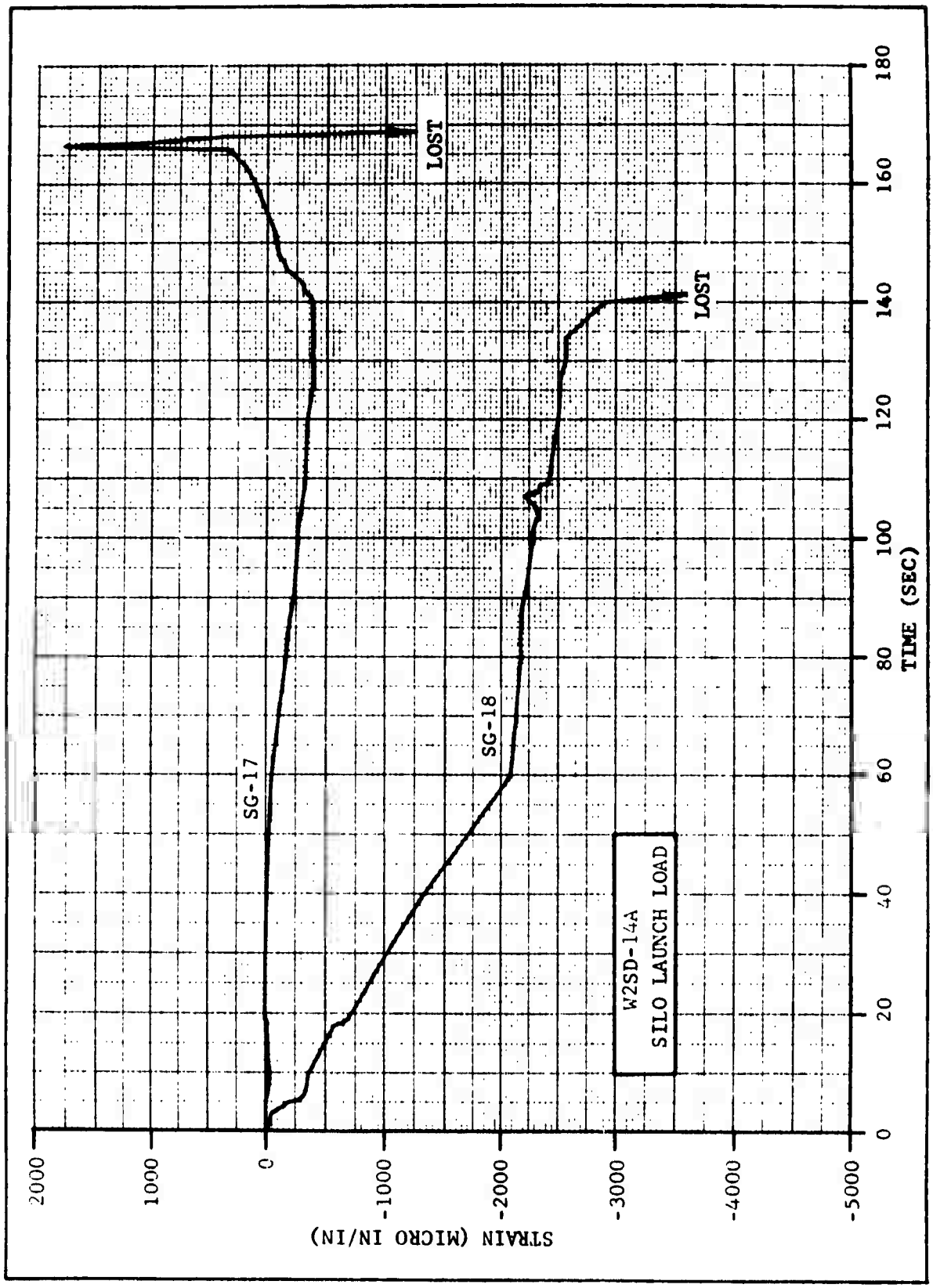


FIGURE 35 Strain Versus Time, Phase II, W2SD-14A, Gages 17 and 18

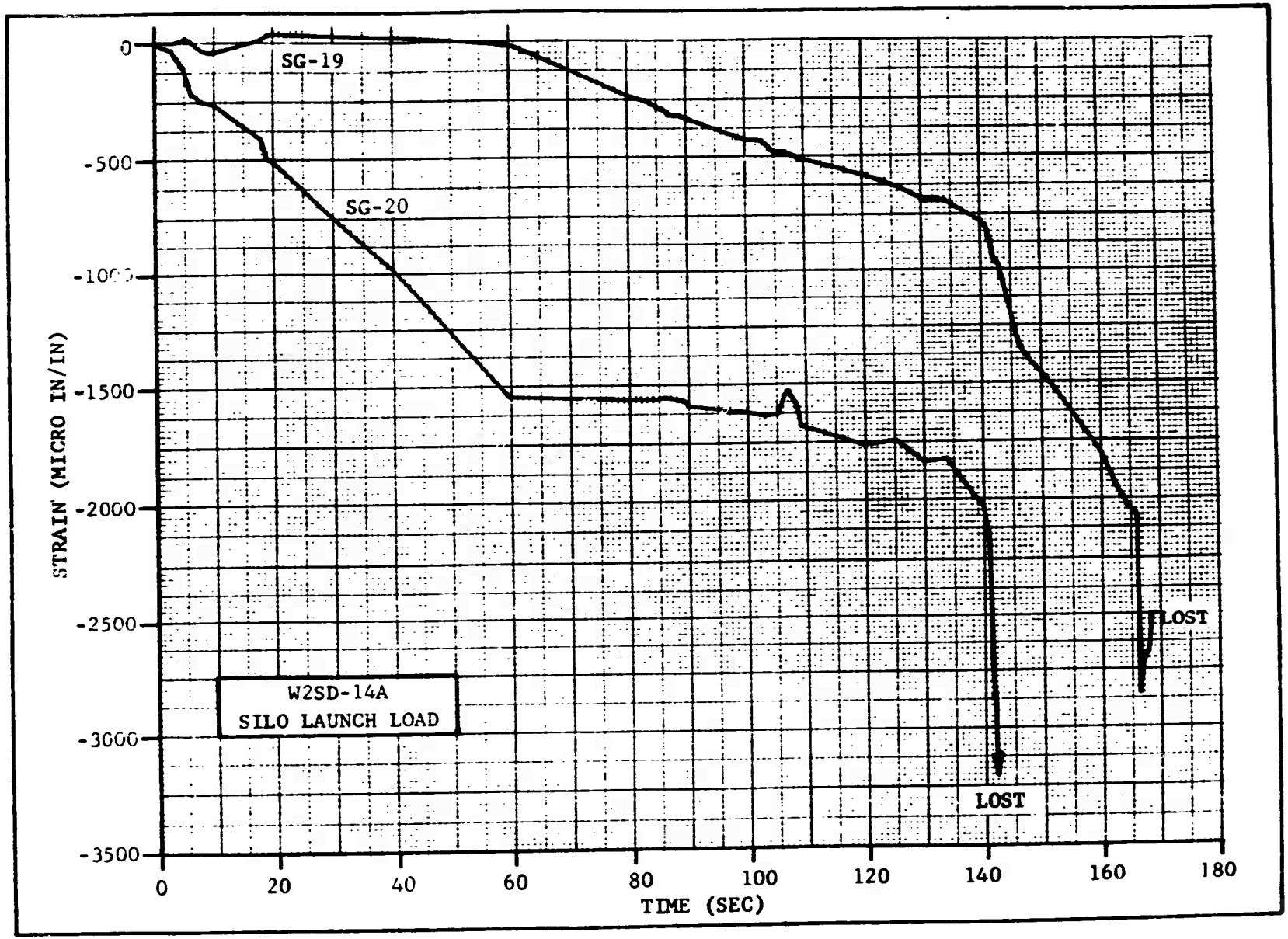


FIGURE 36 Strain Versus Time, Phase II, W2SD-14A, Gages 19 and 20

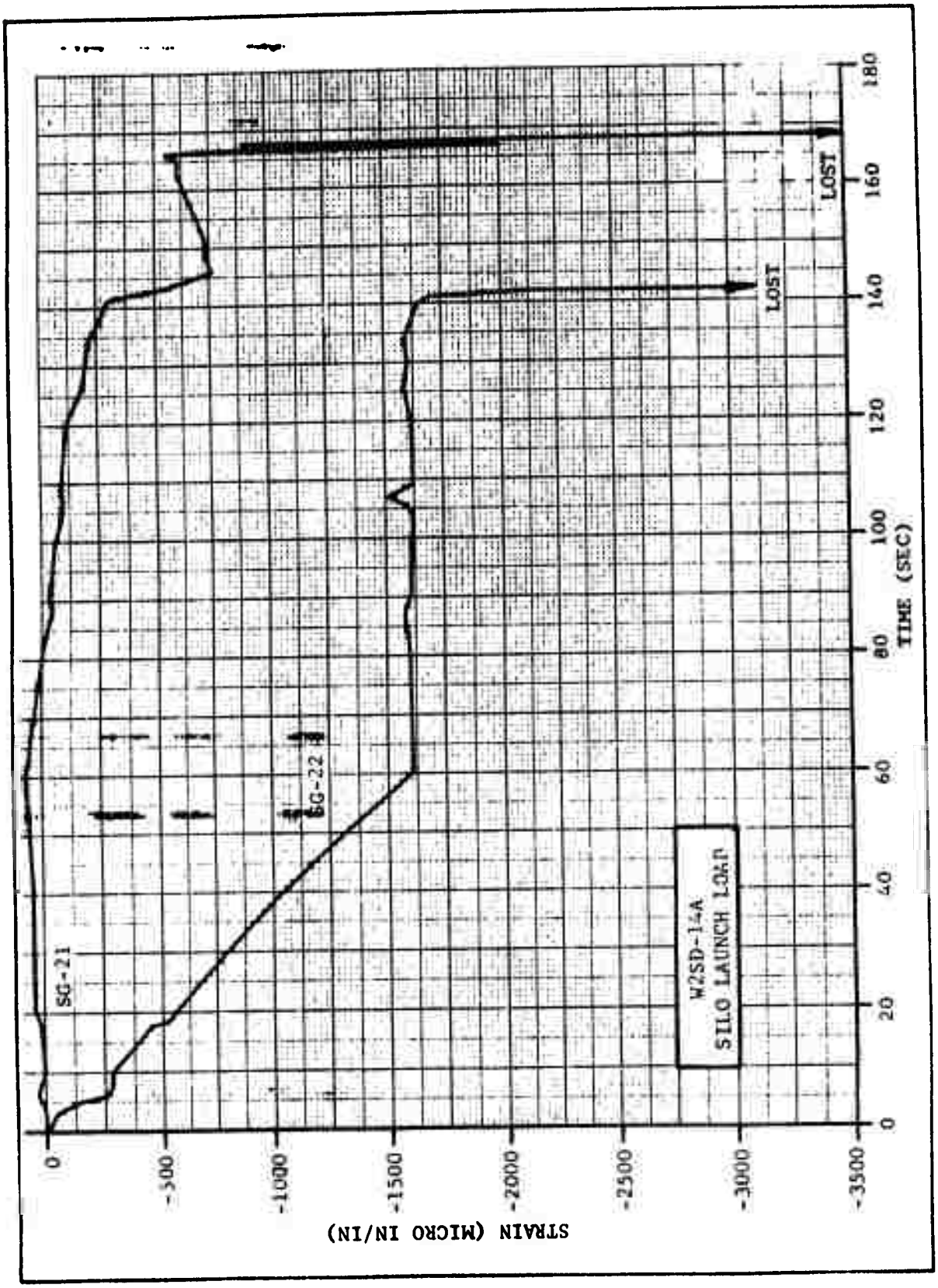


FIGURE 37 Strain Versus Time, Phase II, W2SD-14A, Gages 21 and 22

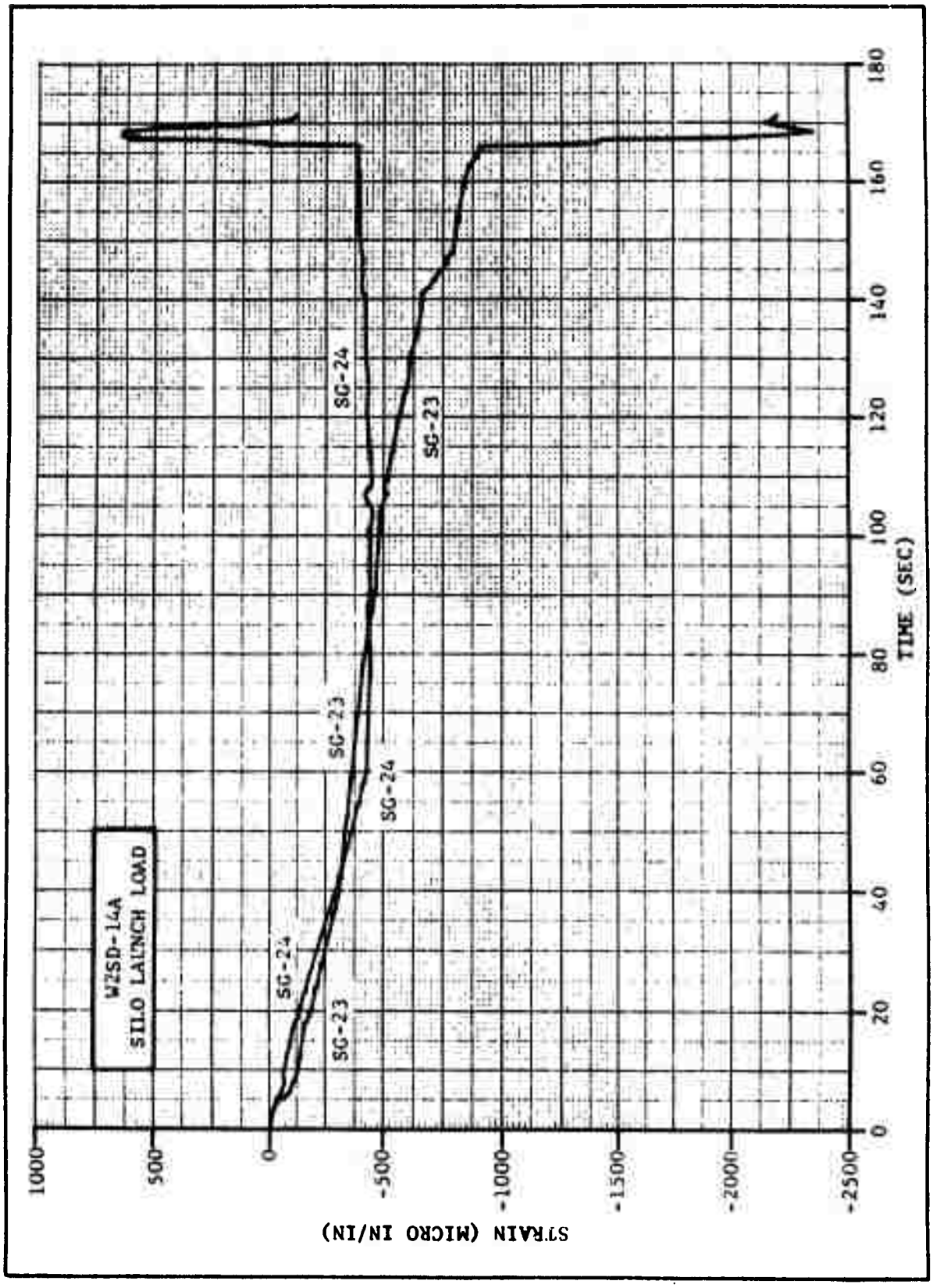


FIGURE 38 Strain Versus Time, Phase II, W2SD-14A, Gages 23 and 24

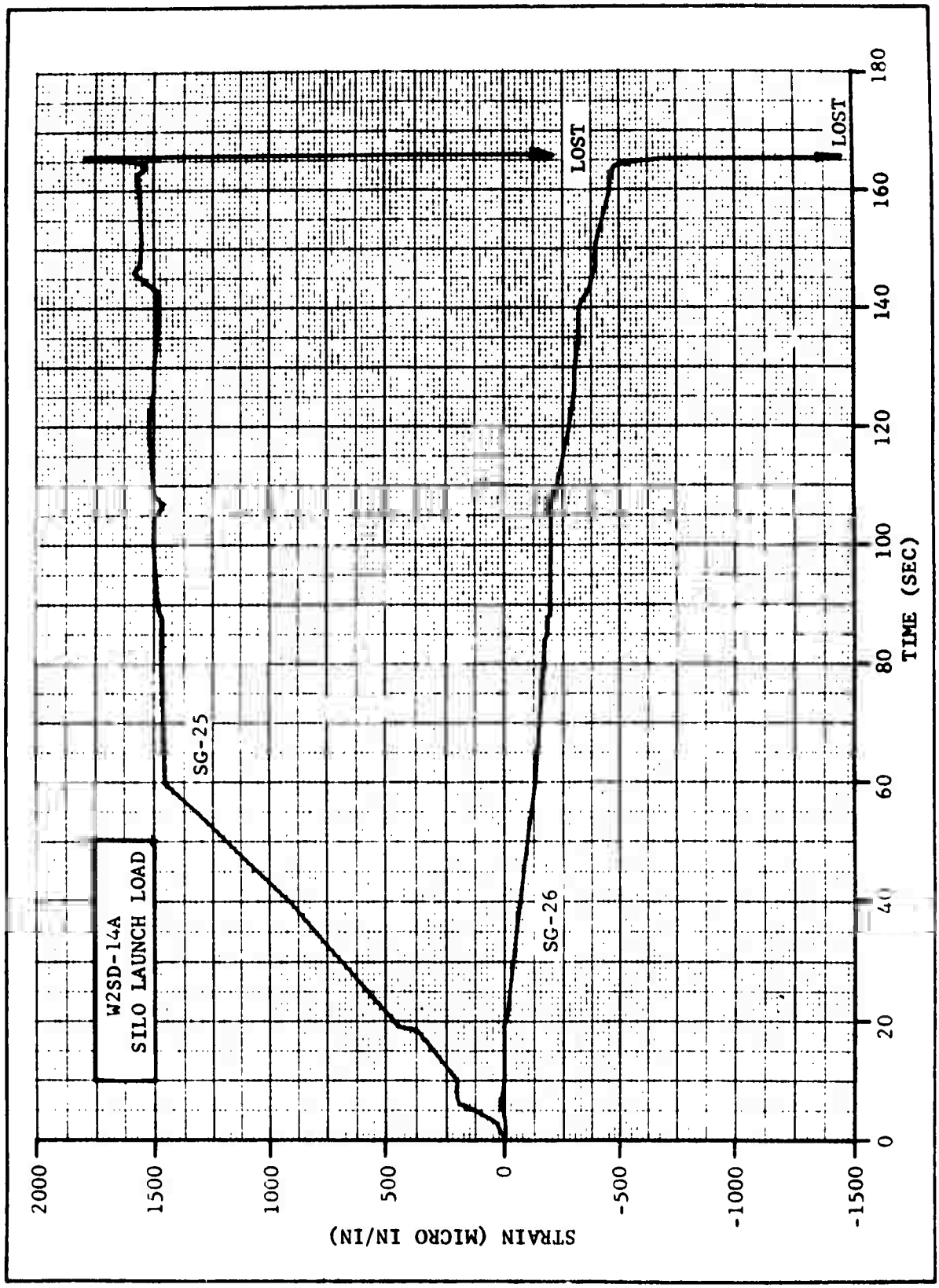


FIGURE 39 Strain Versus Time, Phase II, W2SD-14A, Gages 25 and 26

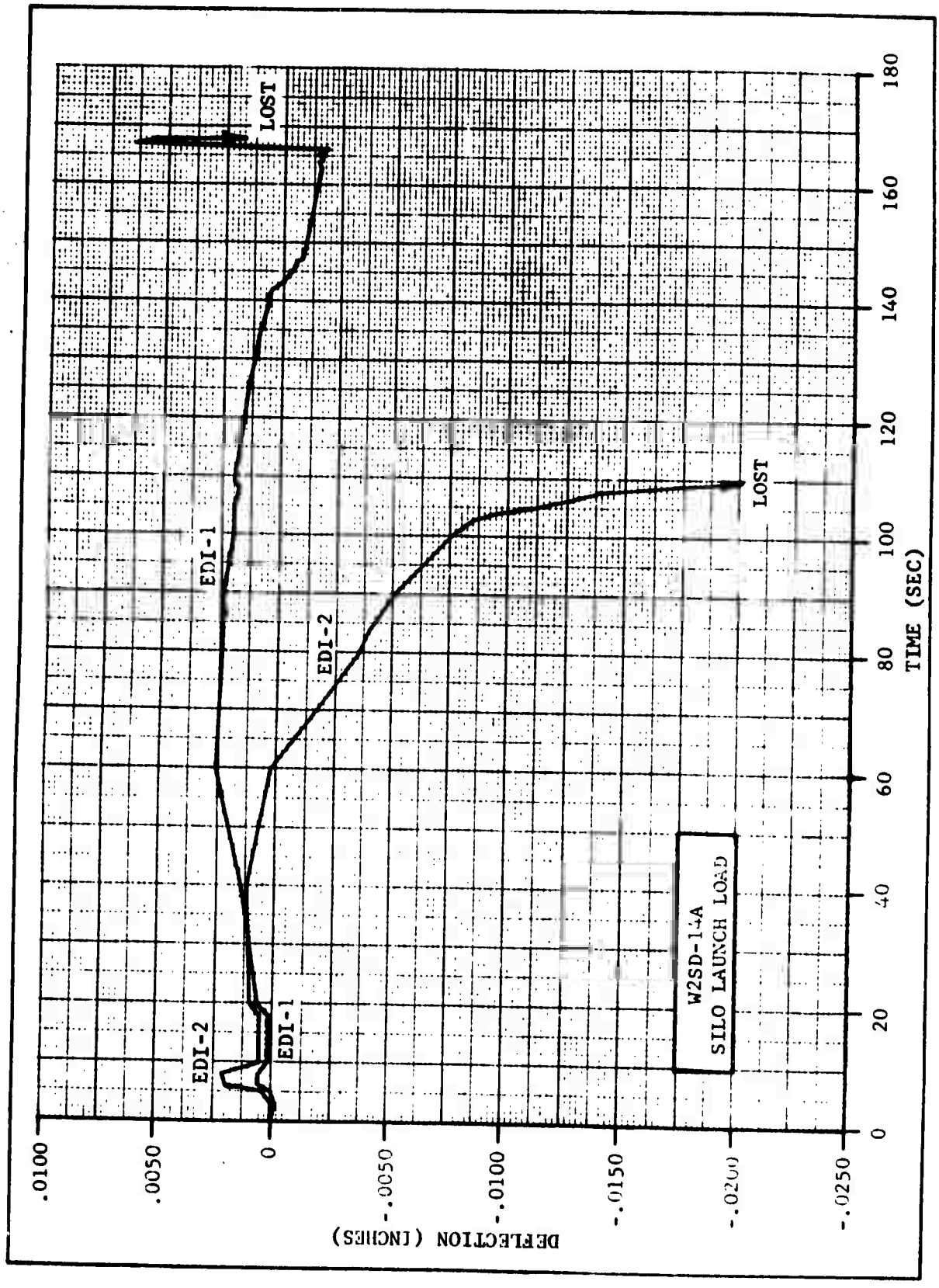


FIGURE 40 Deflection Versus Time, Phase II, W2SD-14A, Gages 1 and 2

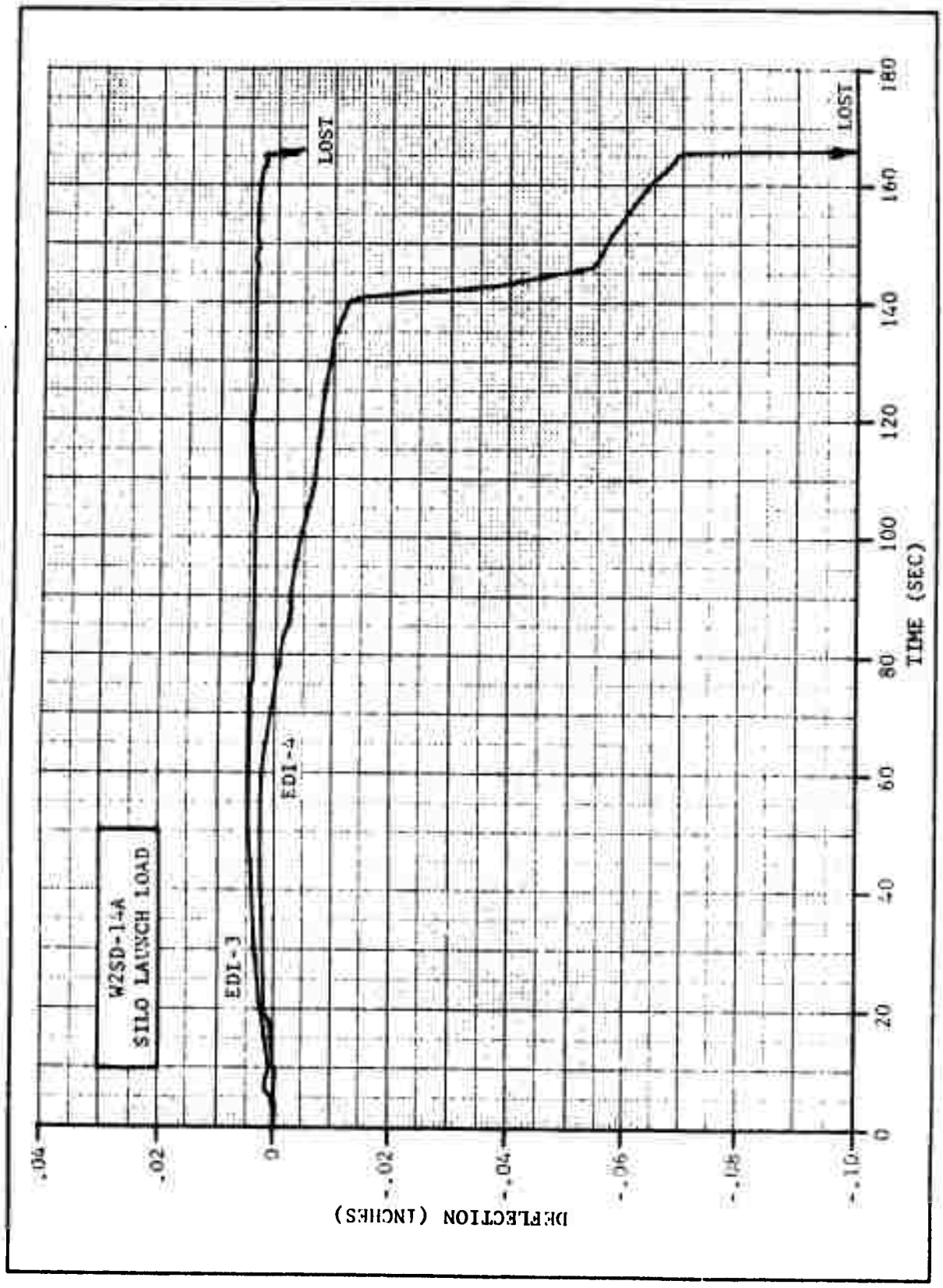
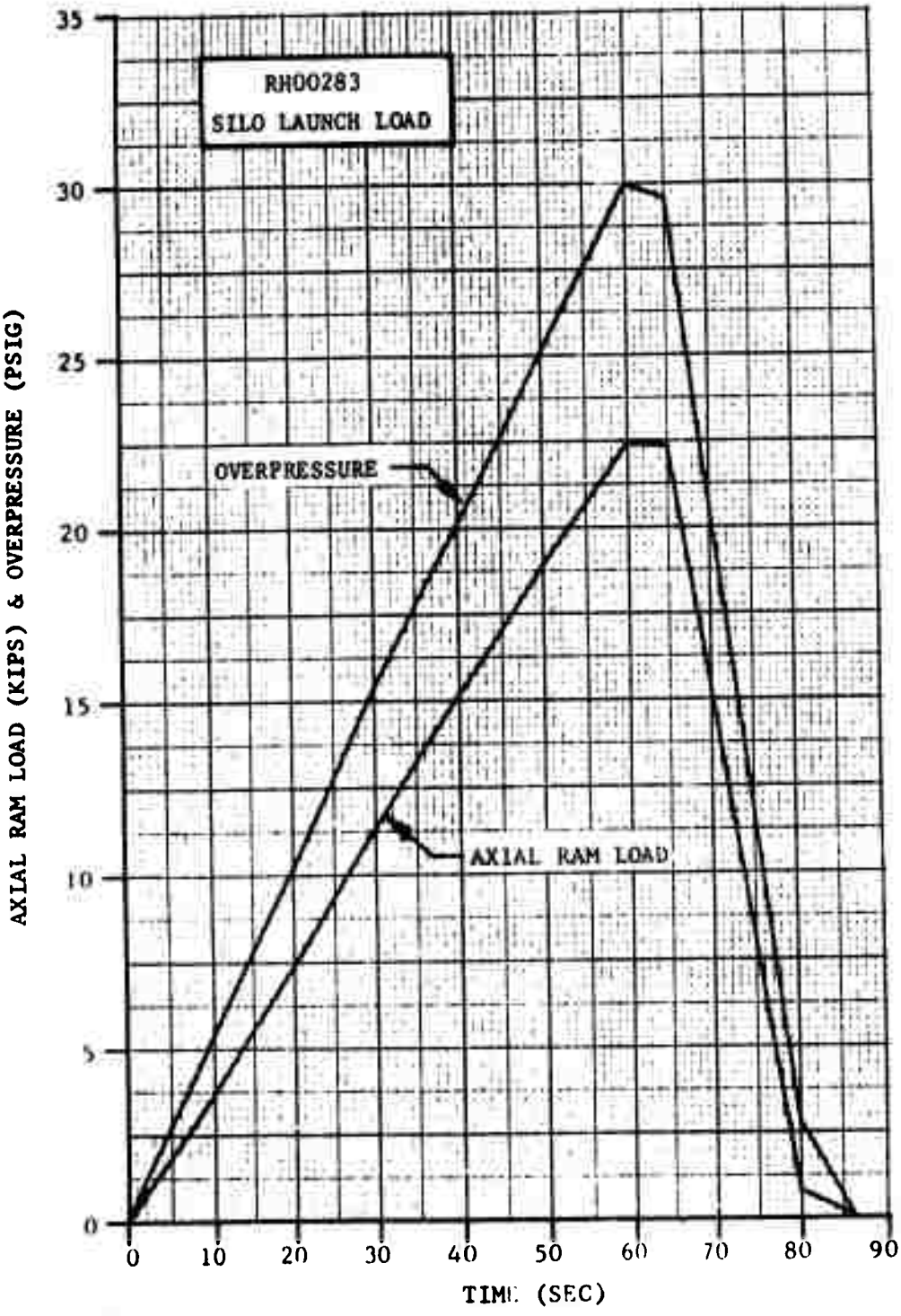


FIGURE 41 Deflection Versus Time, Phase II, W2SD-14A, Gages 3 and 4



NOTE: TO OBTAIN TOTAL AXIAL
MULTIPLY AXIAL RAM LOAD BY
2 AND ADD 3400 LBS HEAD WEIGHT

FIGURE 42 Actual Loads, Phase I, RH00283

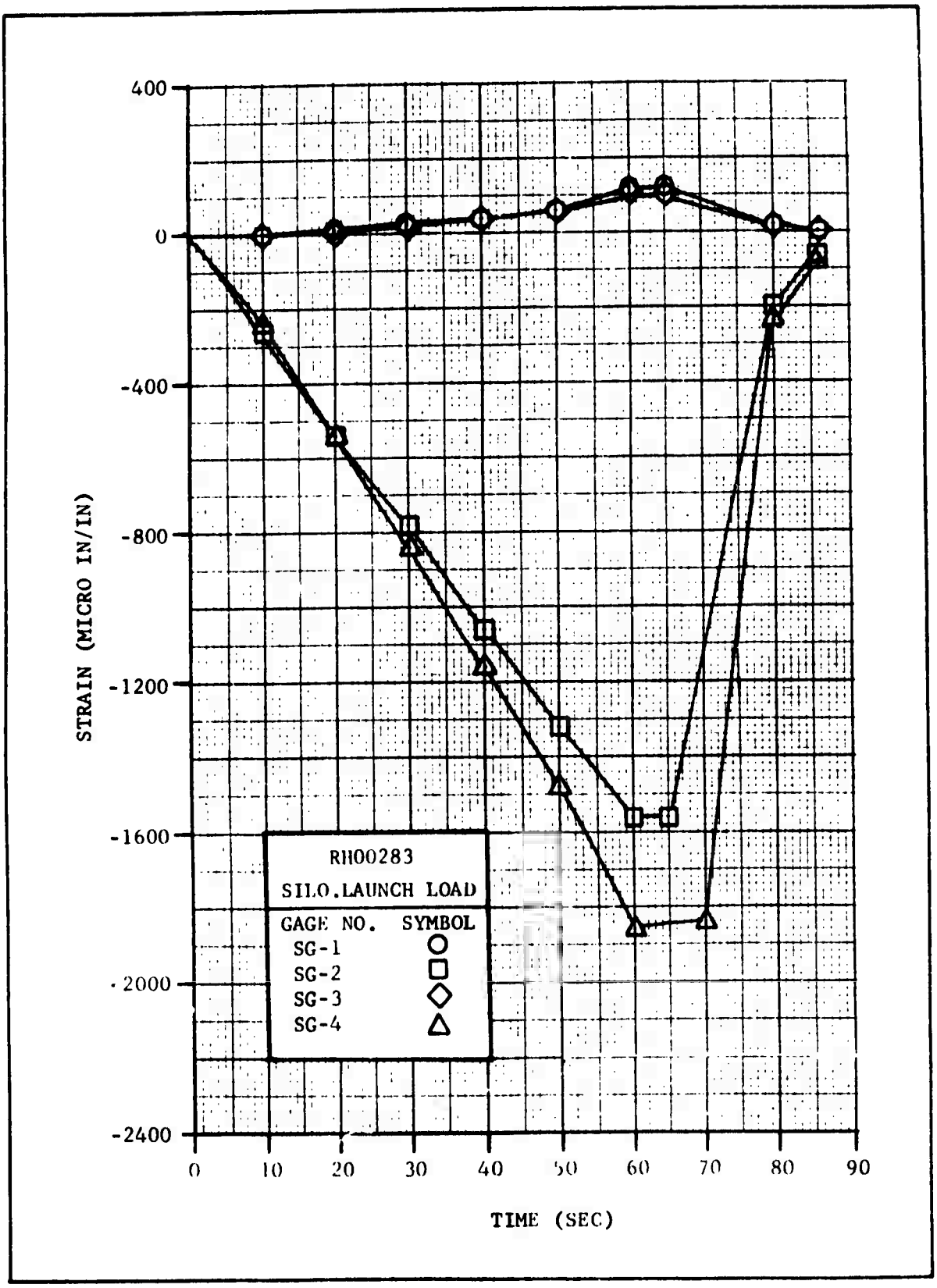


FIGURE 43 Strain Versus Time, Phase I, RH00283 Gages 1, 2, 3 and 4

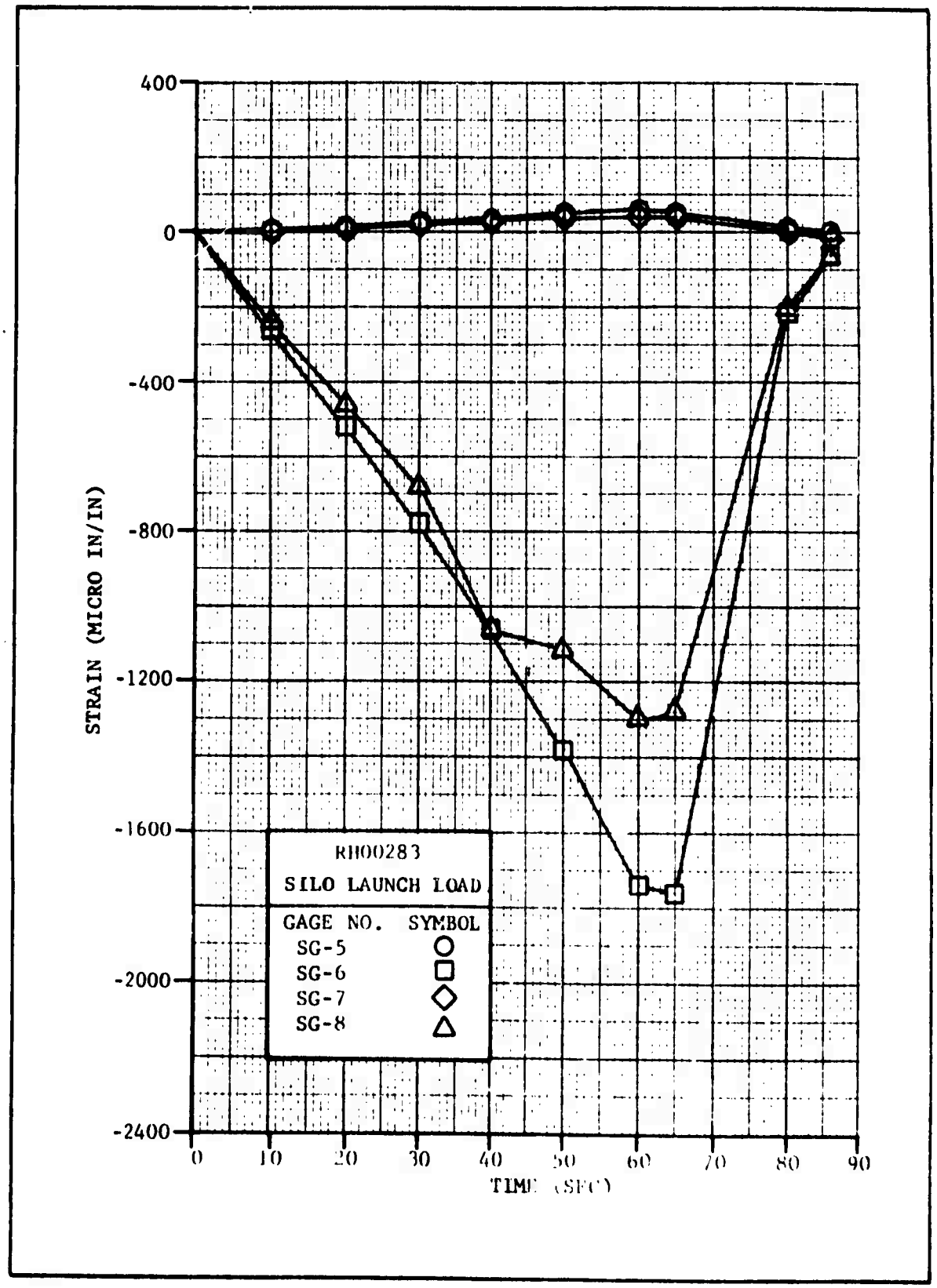


FIGURE 44 Strain Versus Time, Phase 1, RH00283 Gages 5, 6, 7 and 8

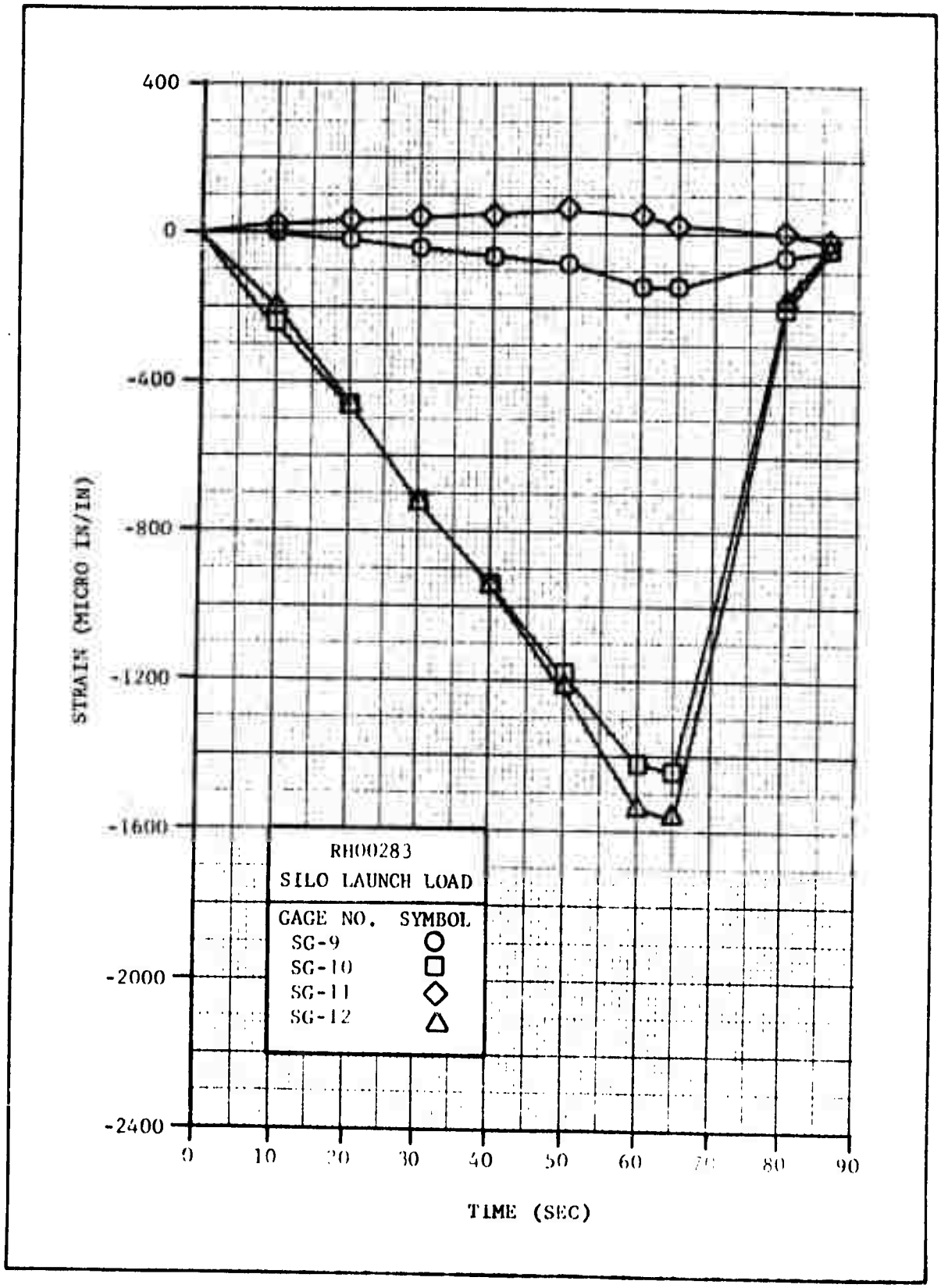


FIGURE 45 Strain Versus Time, Phase I, RH00283 Gages 9, 10, 11 and 12

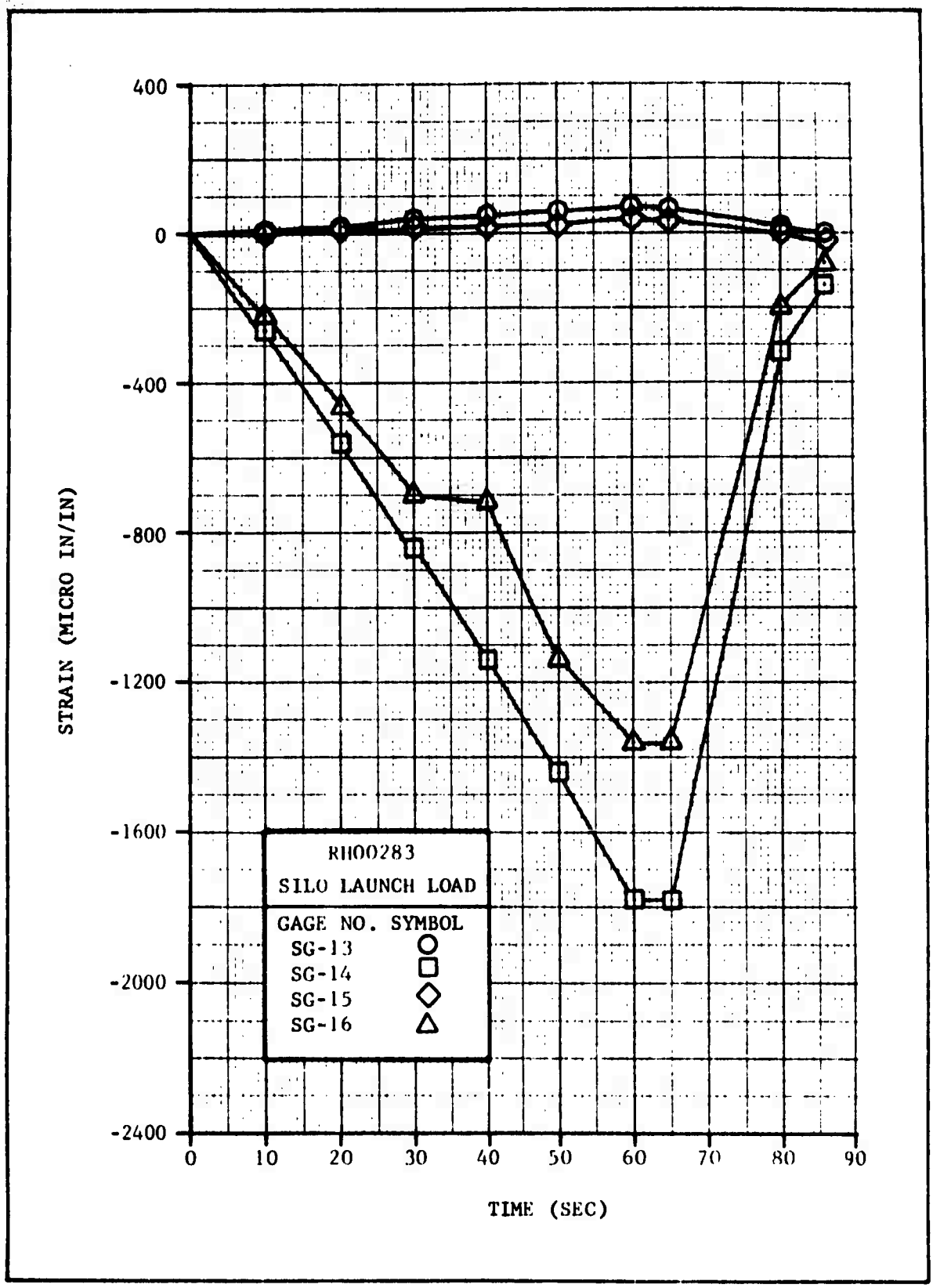


FIGURE 46 Strain Versus Time, Phase I, RH00283 Gages 13, 14, 15 and 16

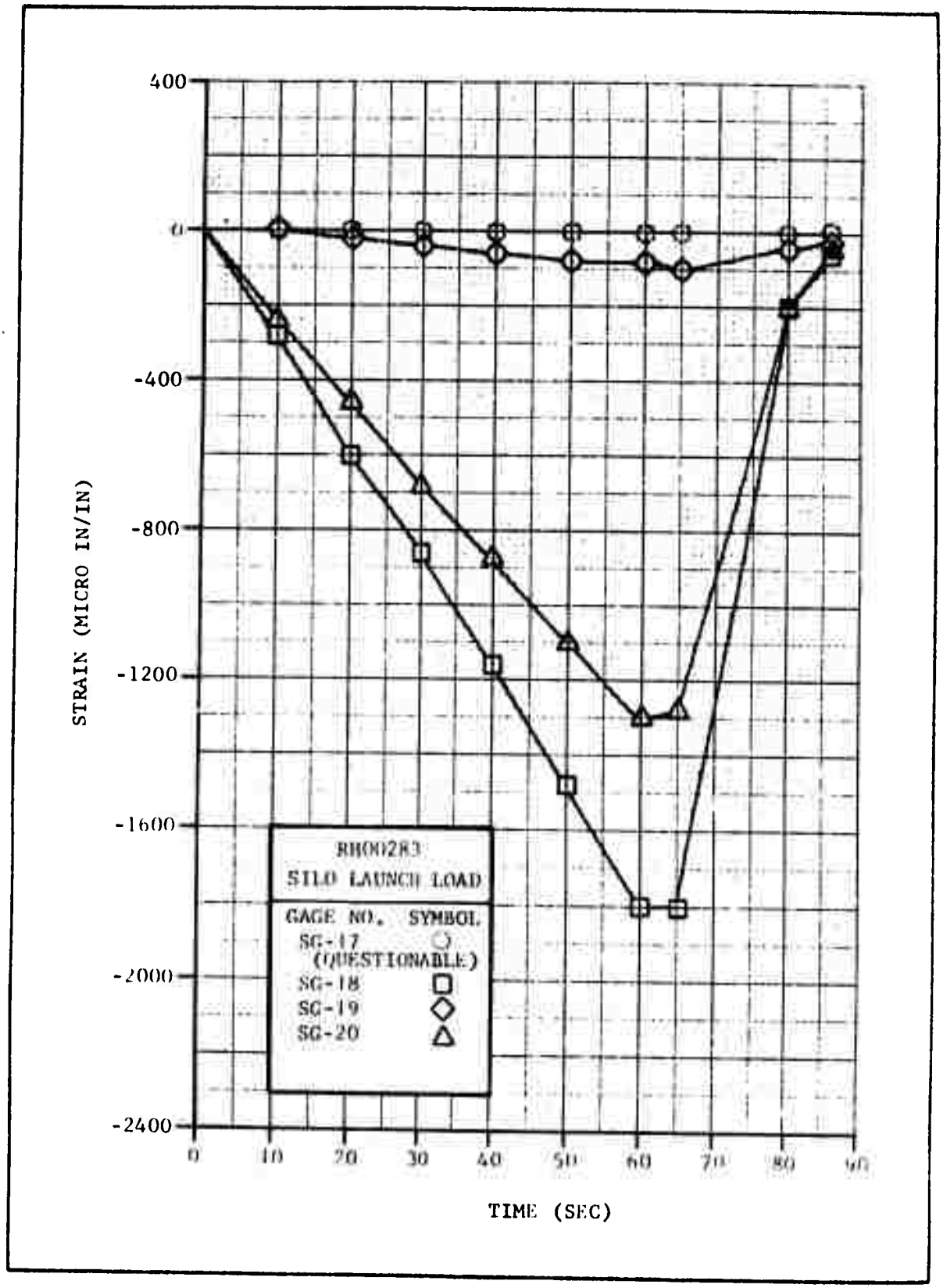


FIGURE 47 Strain Versus Time, Phase I, RH00283 Gages 17, 18, 19 and 20

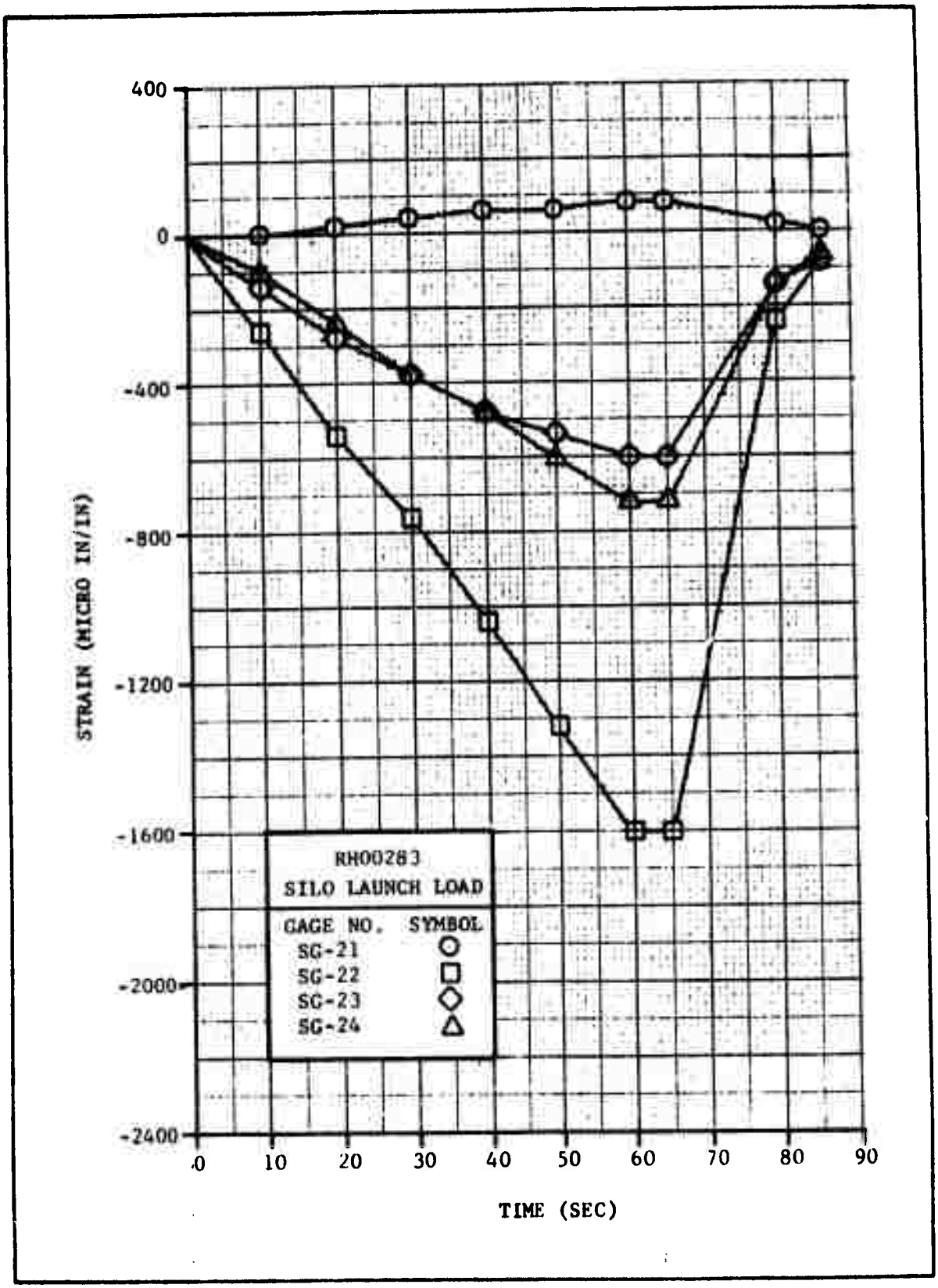


FIGURE 48 Strain Versus Time, Phase I, RH00283 Gages 21, 22, 23 and 24

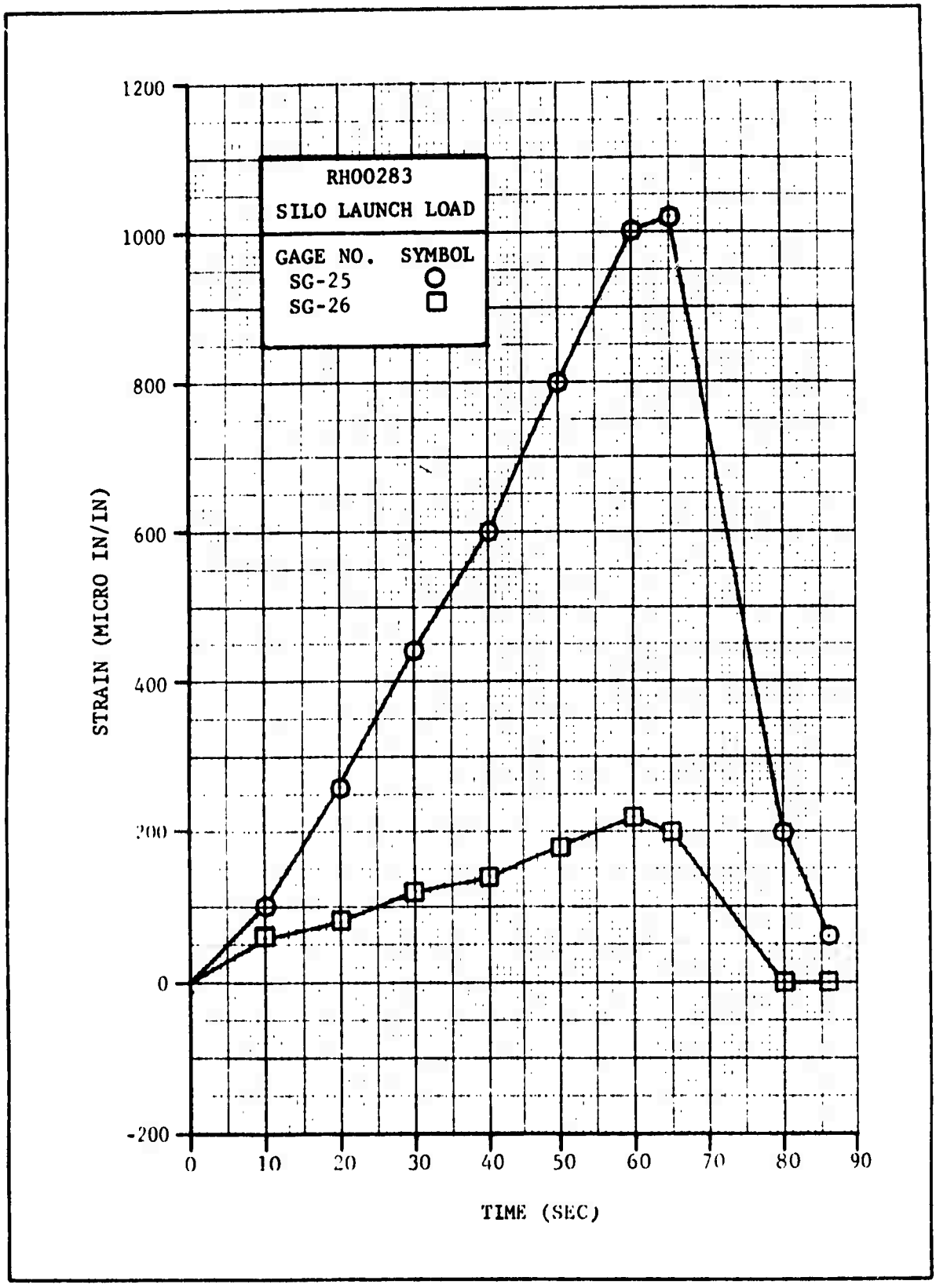


FIGURE 49 Strains Versus Time, Phase I, RH00283 Gages 25 and 26

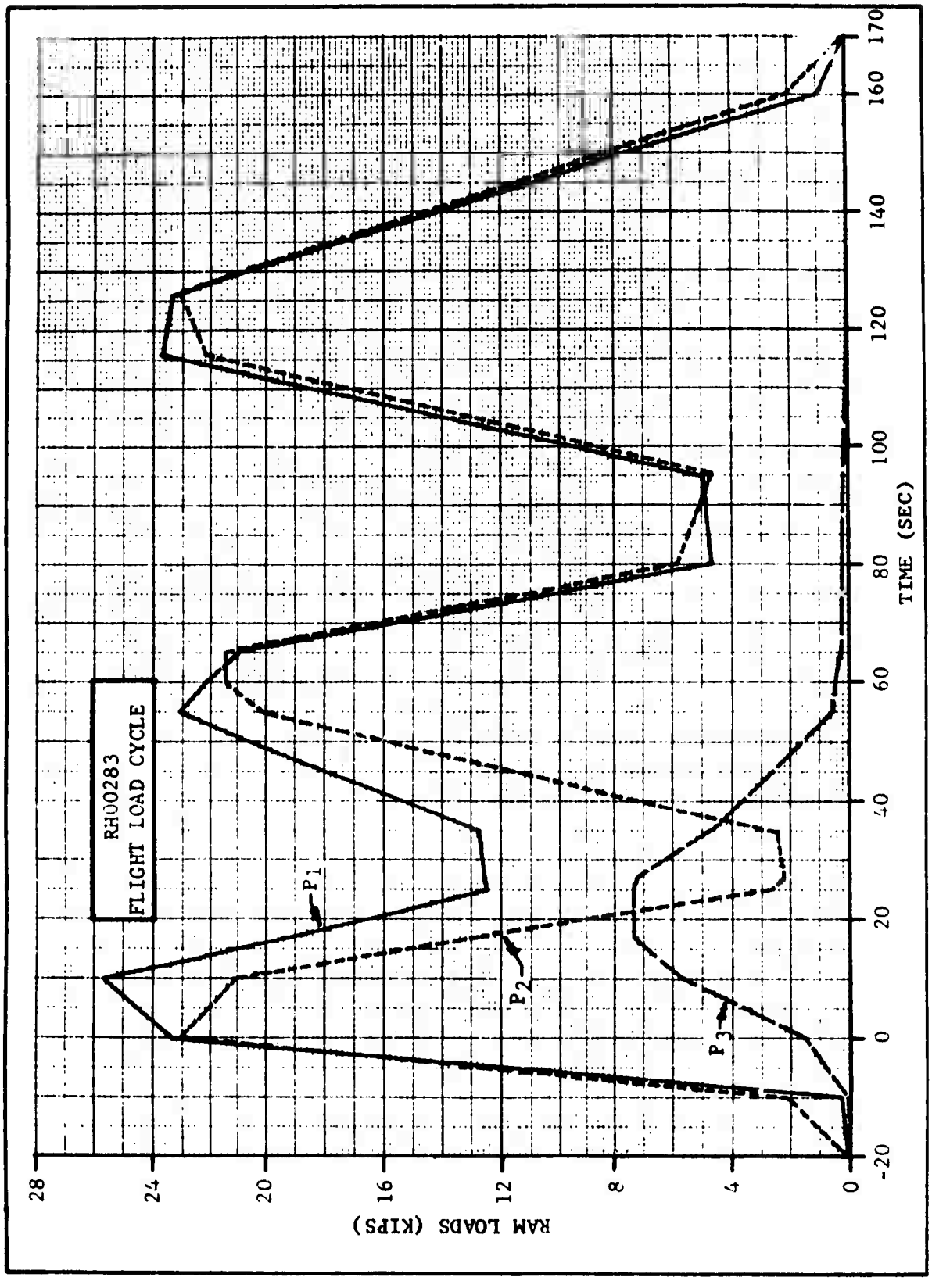


FIGURE 50 Actual Loads, Phase II, RH00283

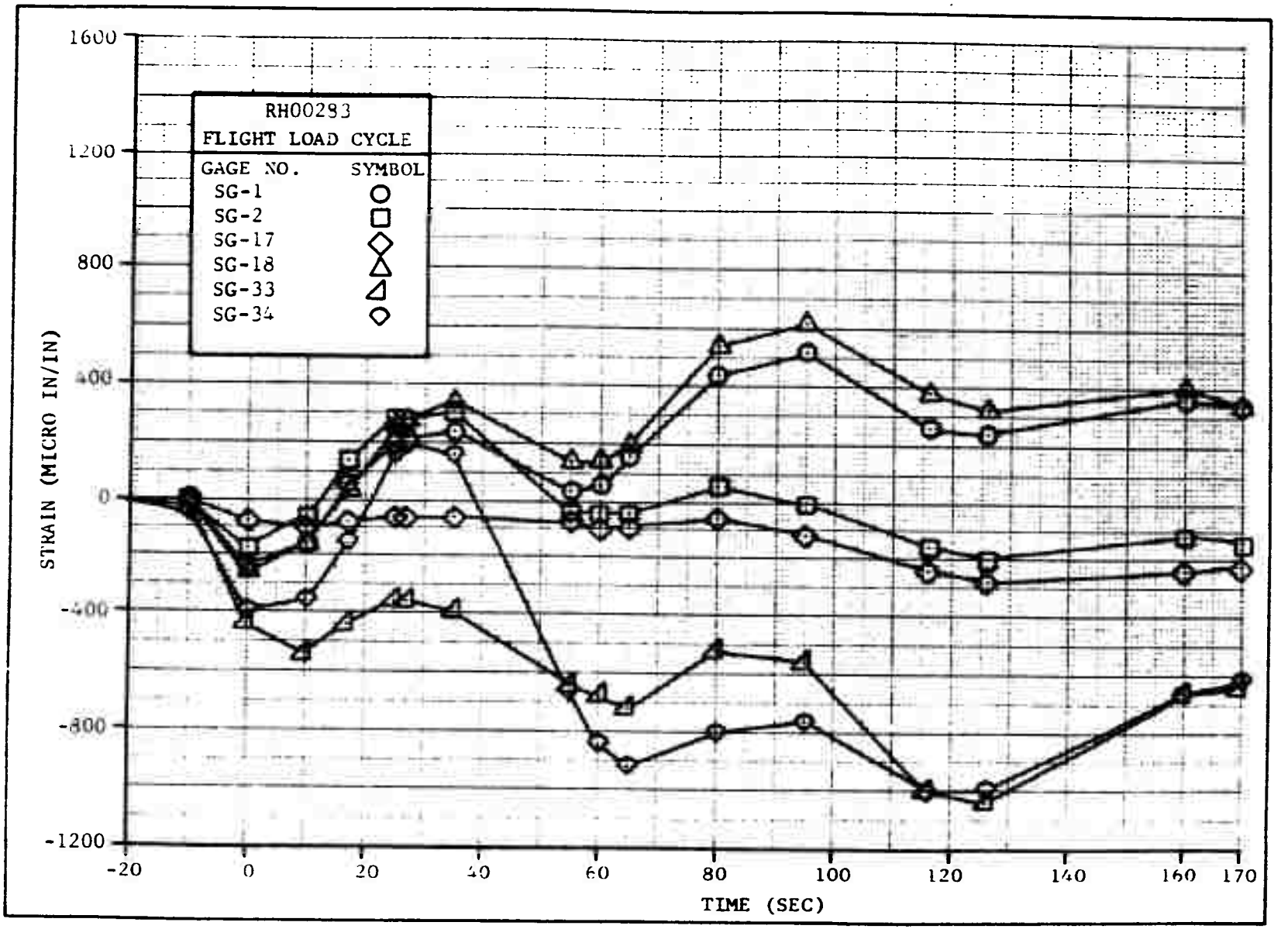


FIGURE 31 Strain Versus Time, Phase II, RH00283 Gages 1, 2, 17, 18, 33 and 34

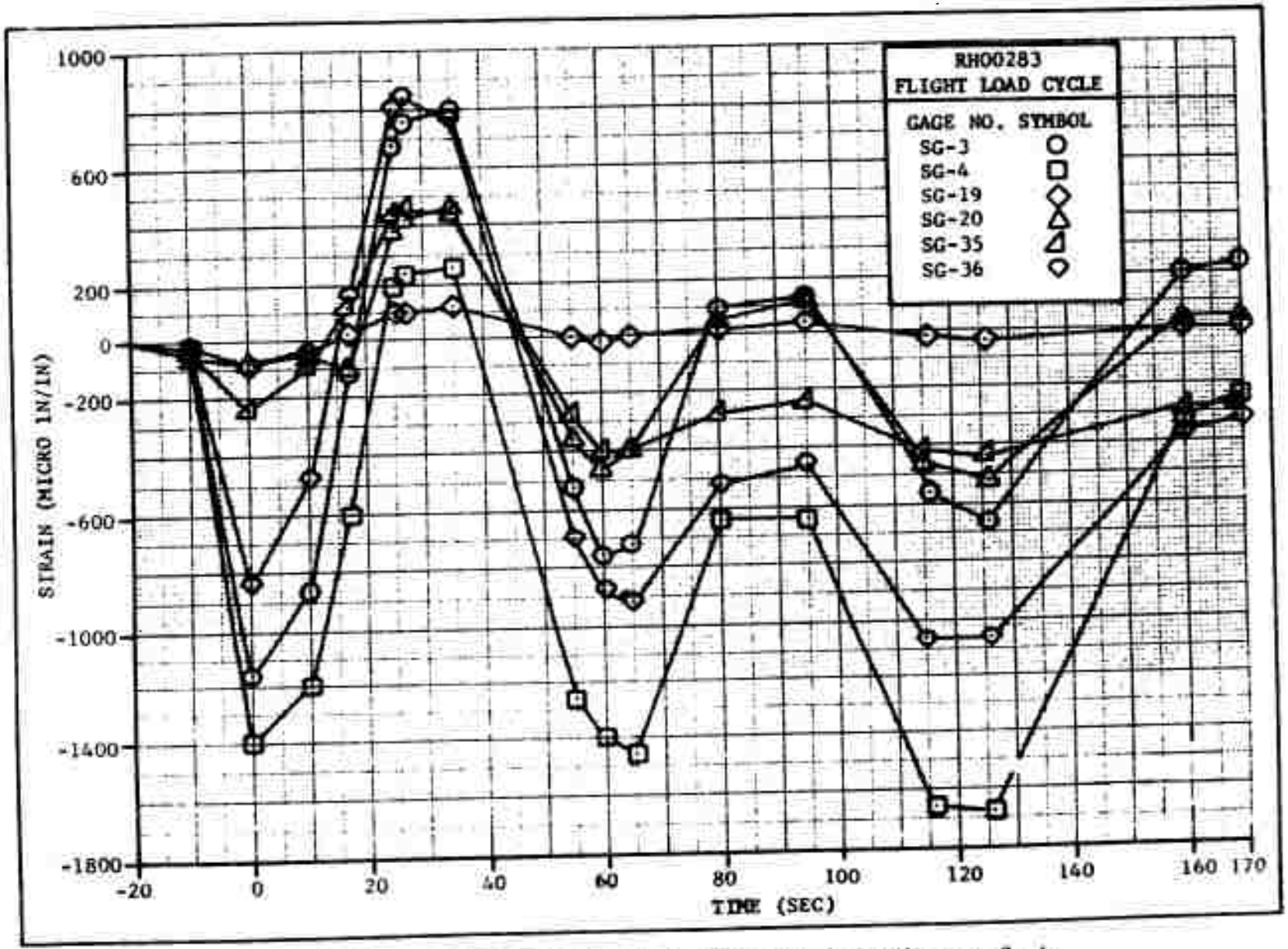


FIGURE 52 Strain Versus Time, Phase II, RH00283 Gages 3, 4, 19, 20, 35 and 36

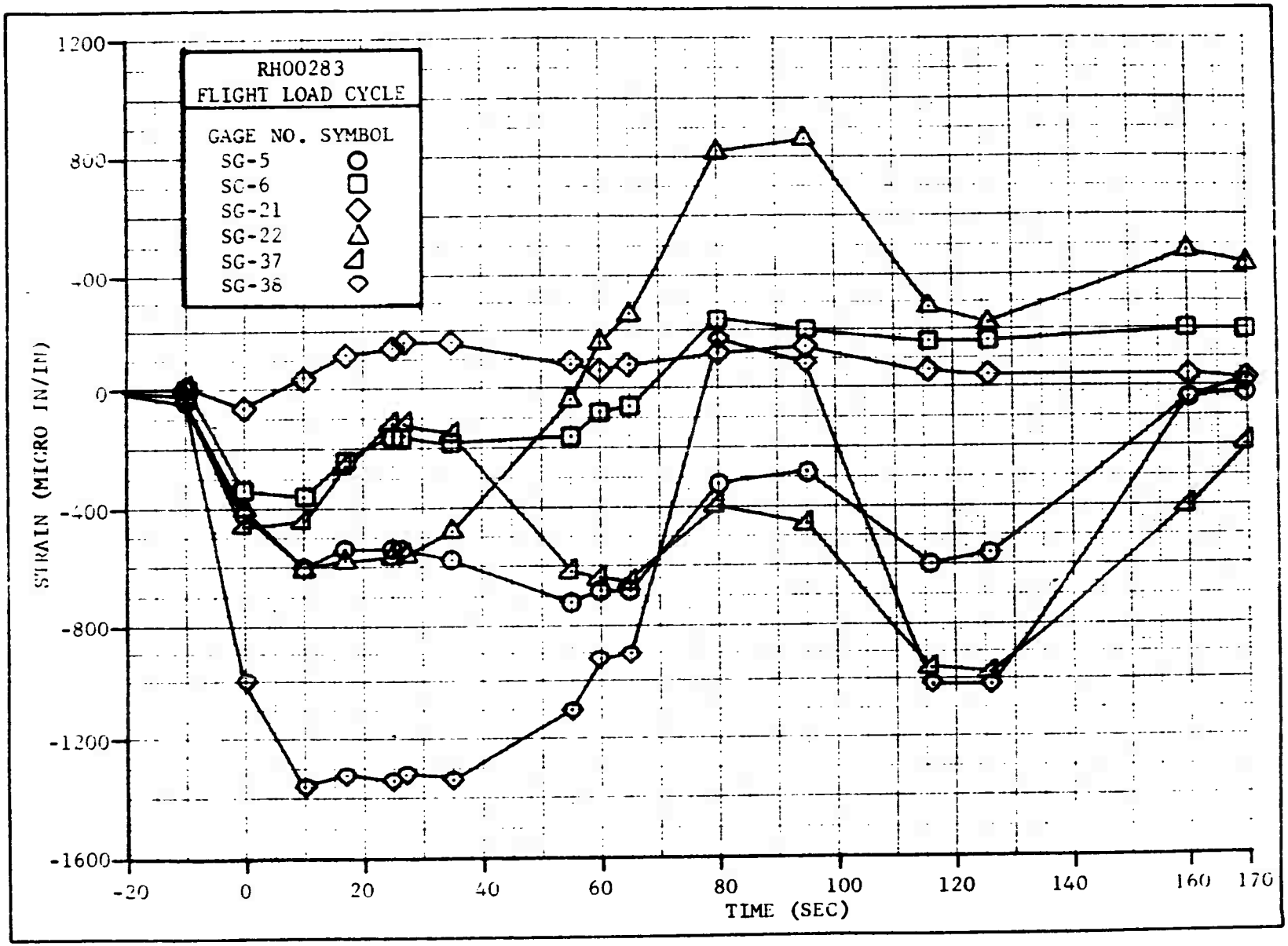


FIGURE 53 Strain Versus Time, Phase II, RH00283 Gages 5, 6, 21, 22, 37 and 38

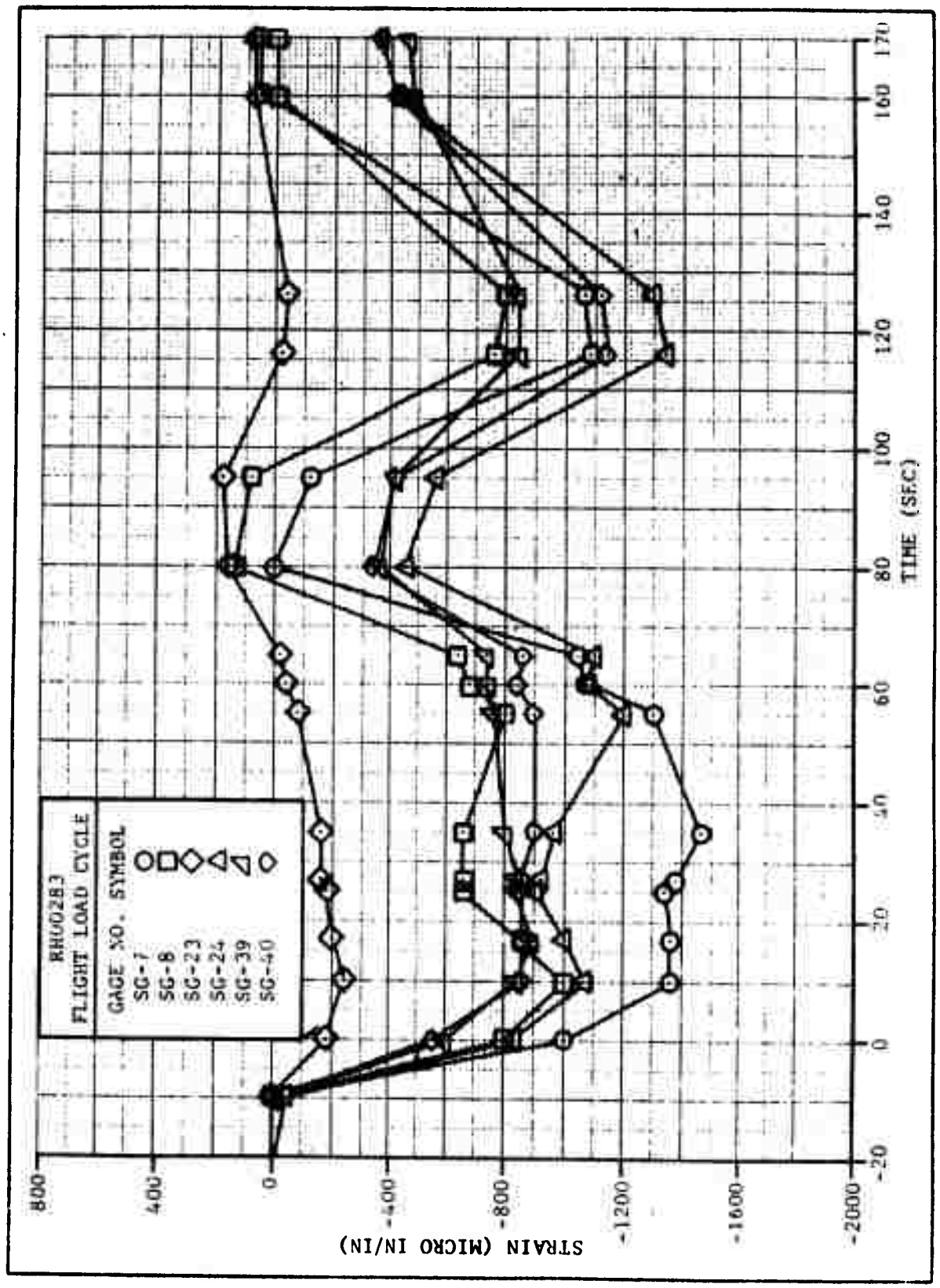


FIGURE 54 Strain Versus Time, Phase II, RH00283 Gages 7, 8, 23, 24, 39 and 40

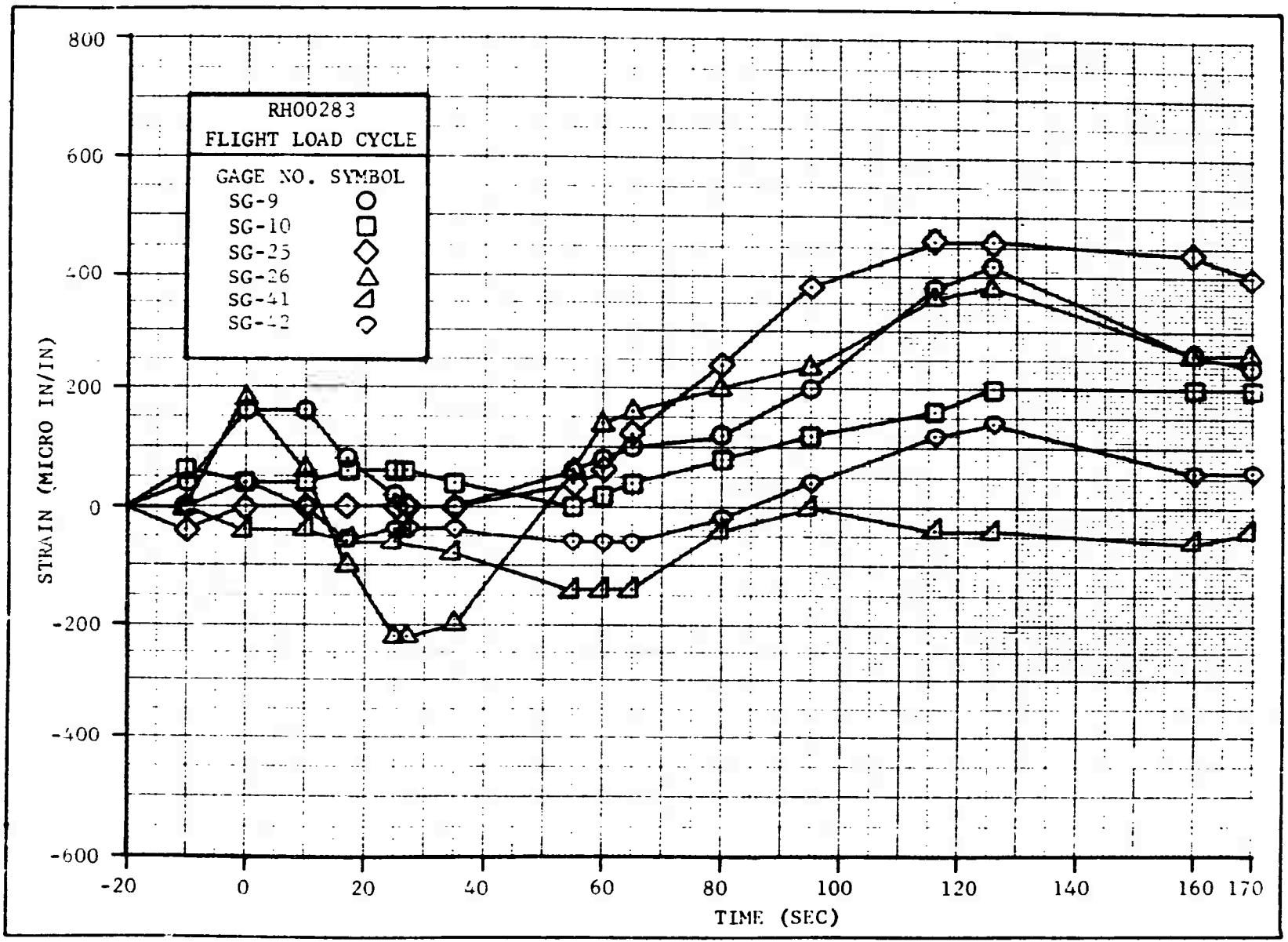


FIGURE 55 Strain Versus Time, Phase II, RH00283 Gages 9, 10, 25, 26, 41 and 42

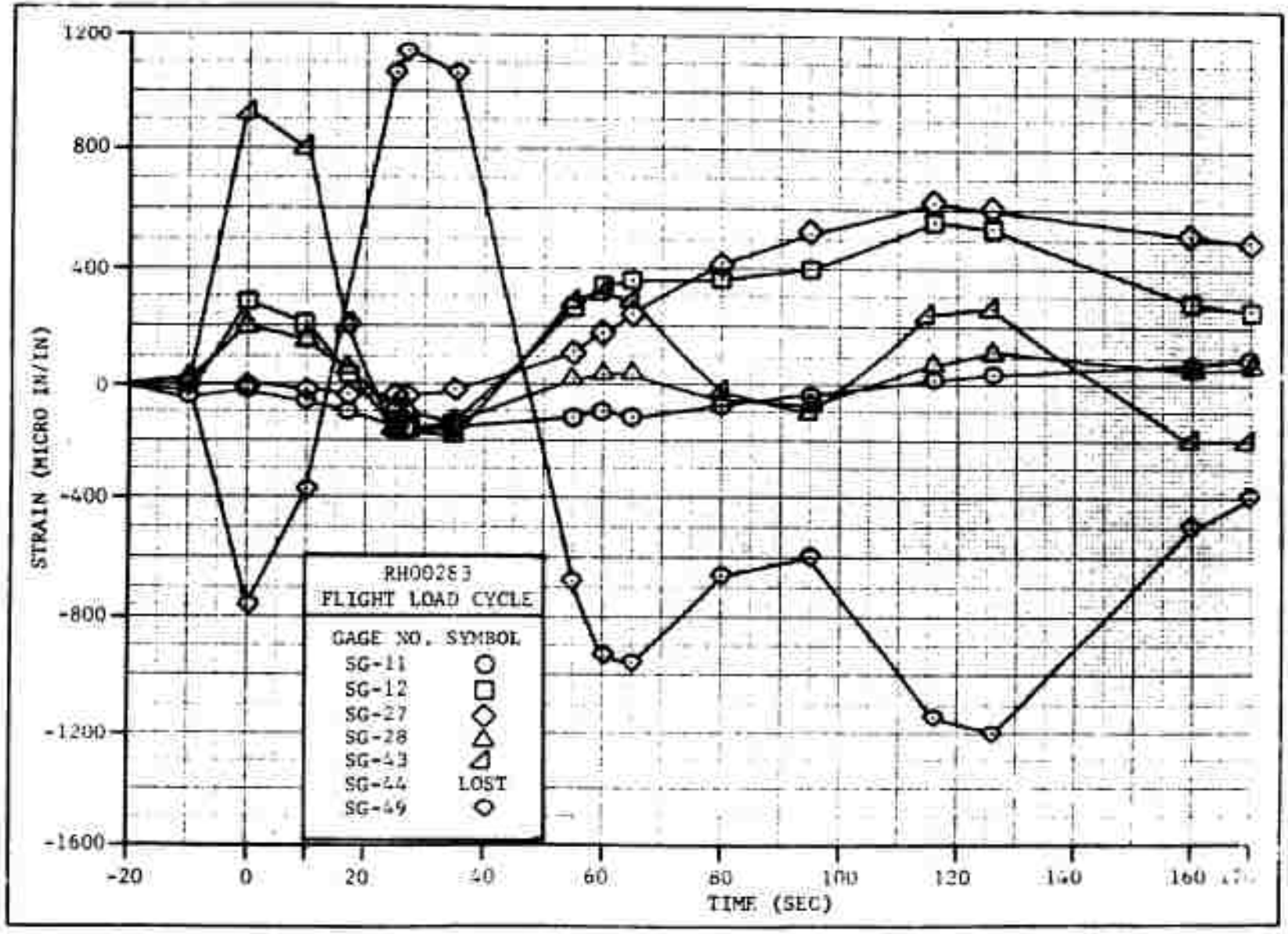


FIGURE 56 Strain Versus Time, Phase II, RH00283 Gages 11, 12, 27, 28, 43, 44 and 49

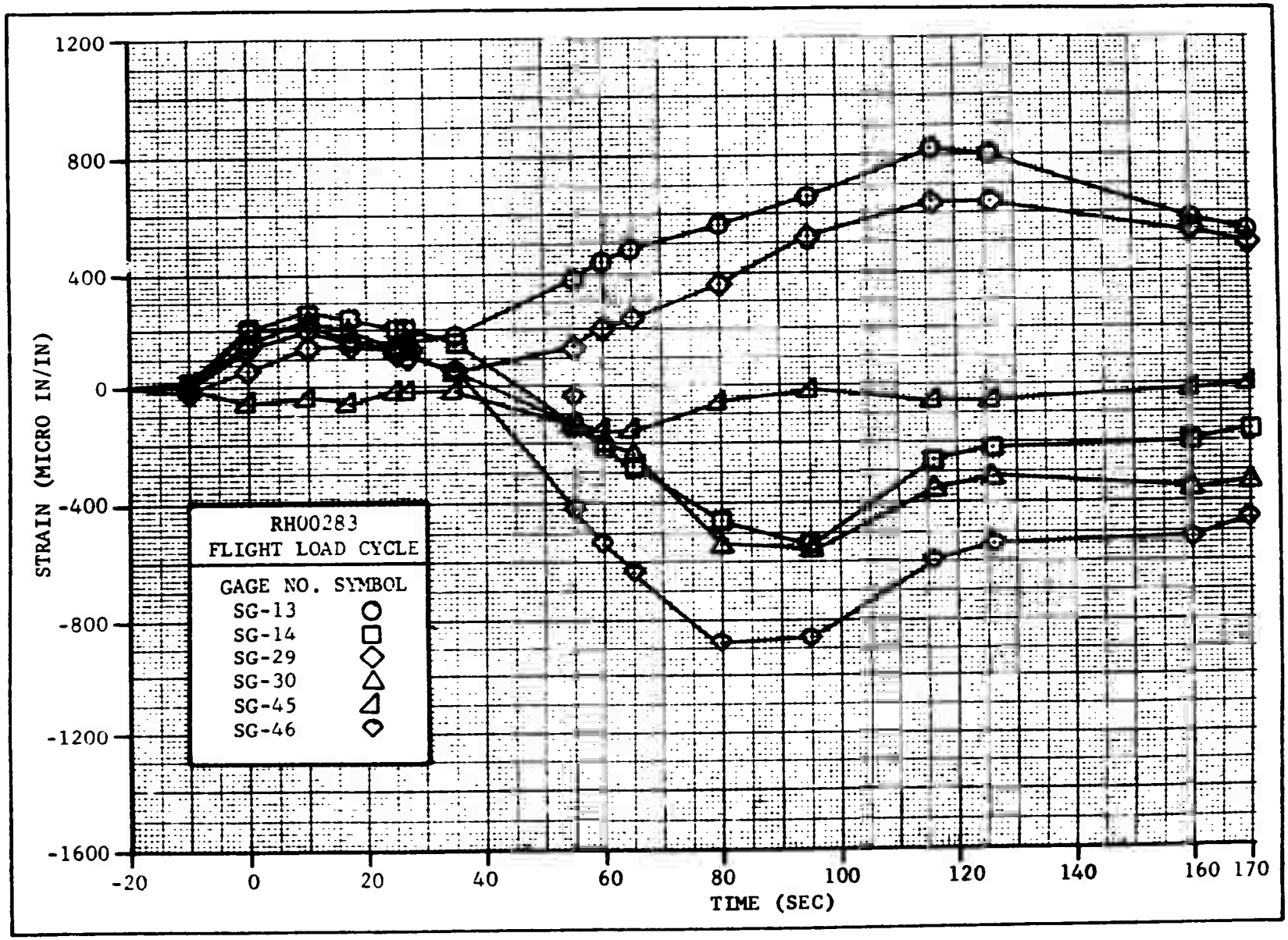


FIGURE 57 Strain Versus Time, Phase II, RH00283 Gages 13, 14, 29, 30, 45 and 46

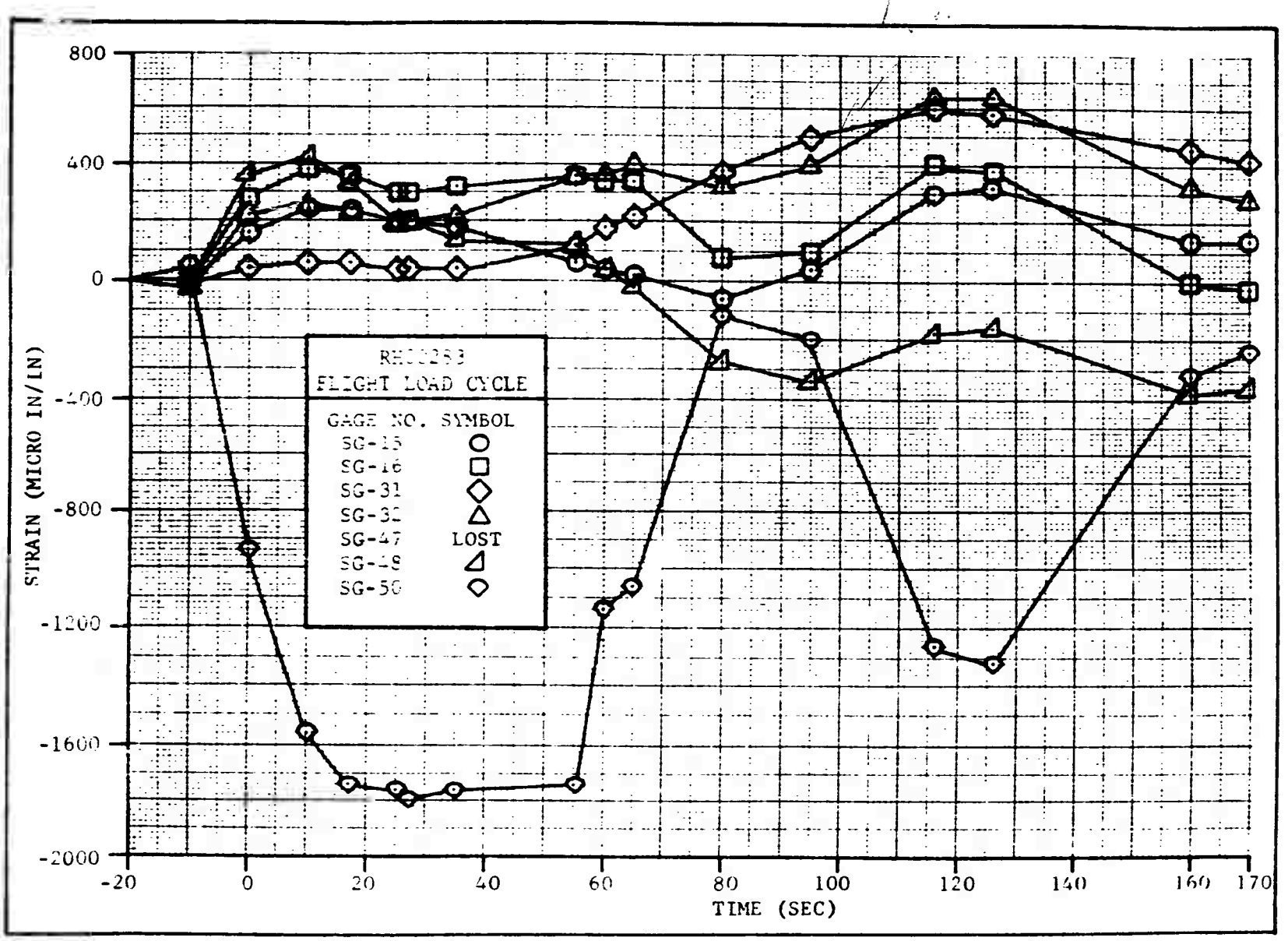


FIGURE 58 Strain Versus Time, Phase II, RH00283 Gages 15, 16, 31, 32, 47, 48 and 50

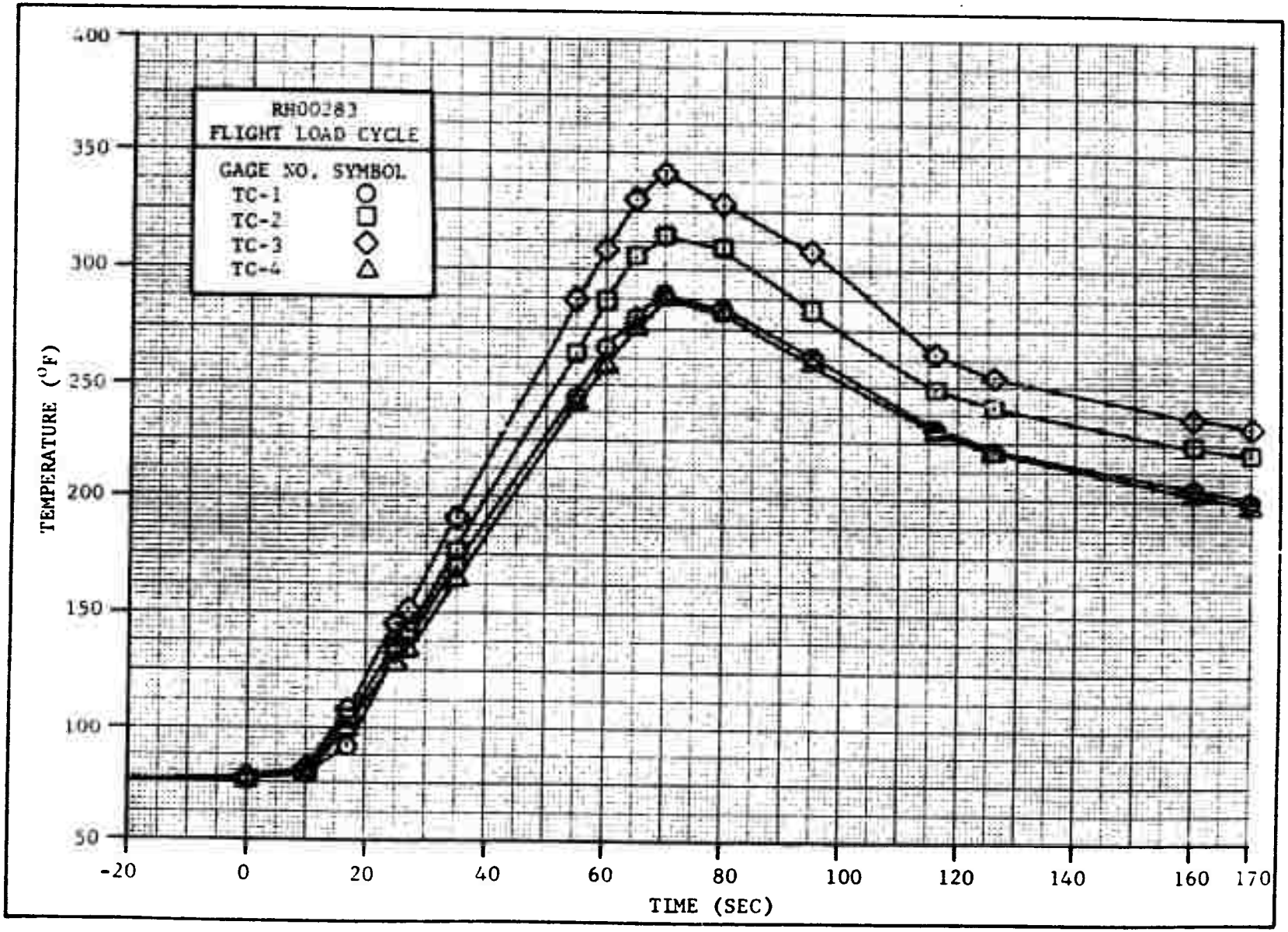


FIGURE 59 Temperature Versus Time, Phase II, RH00283 Gages 1, 2, 3 and 4

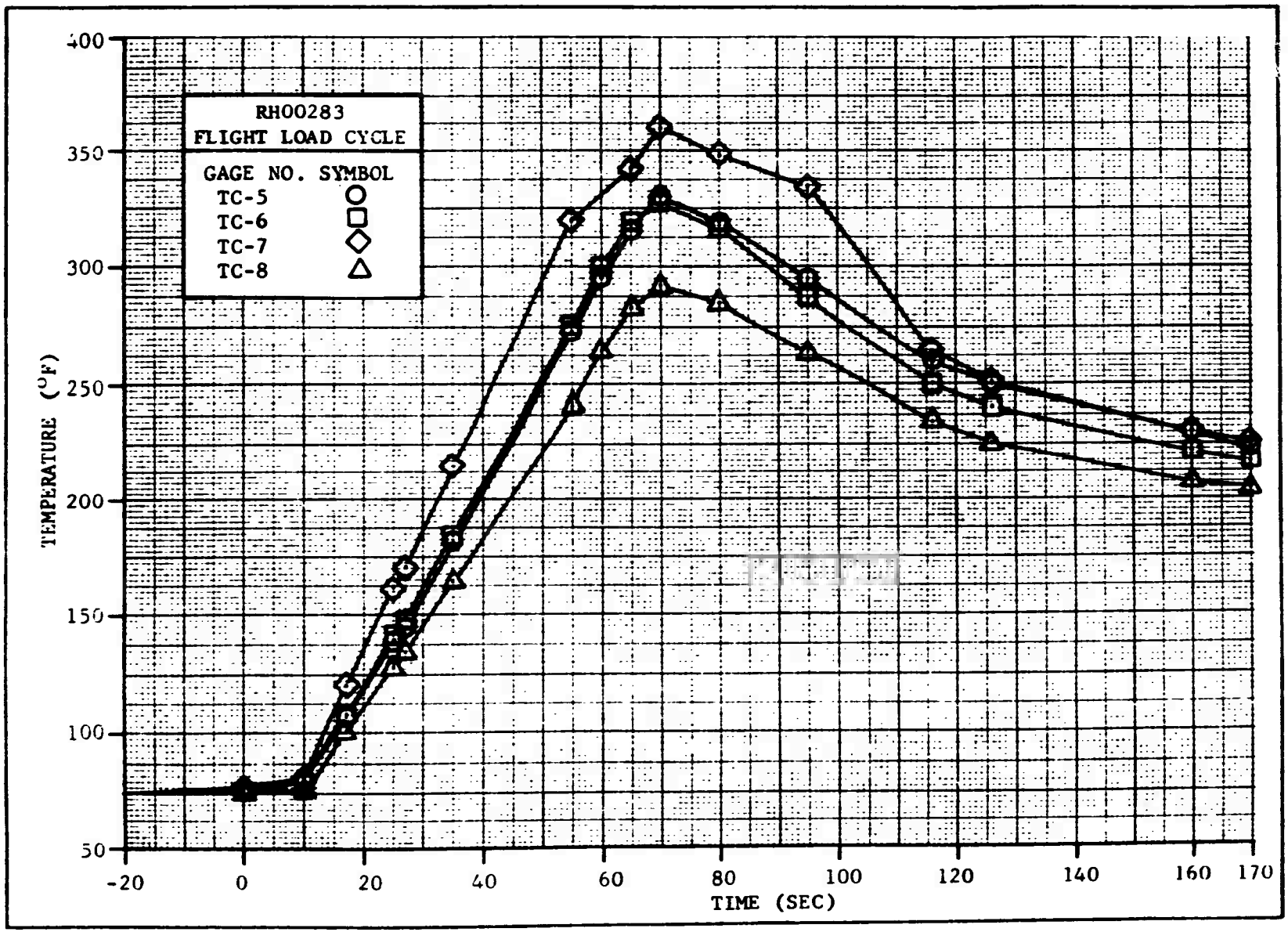


FIGURE 60 Temperature Versus Time, Phase II, RH00283 Gages 5, 6, 7 and 8

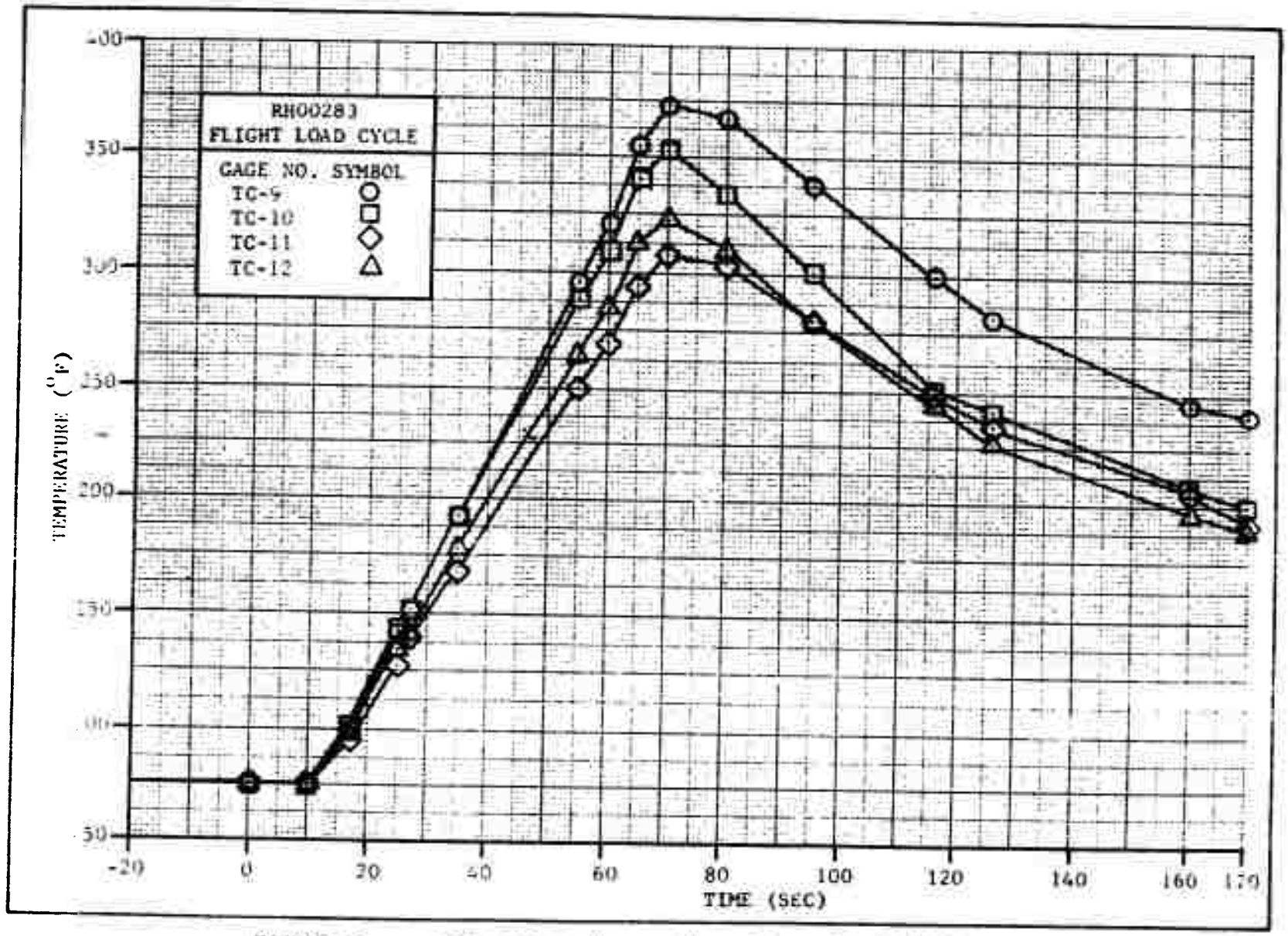


FIGURE 6: Temperature Versus Time, Phase II, RH00283 Gages 9, 10, 11 and 12

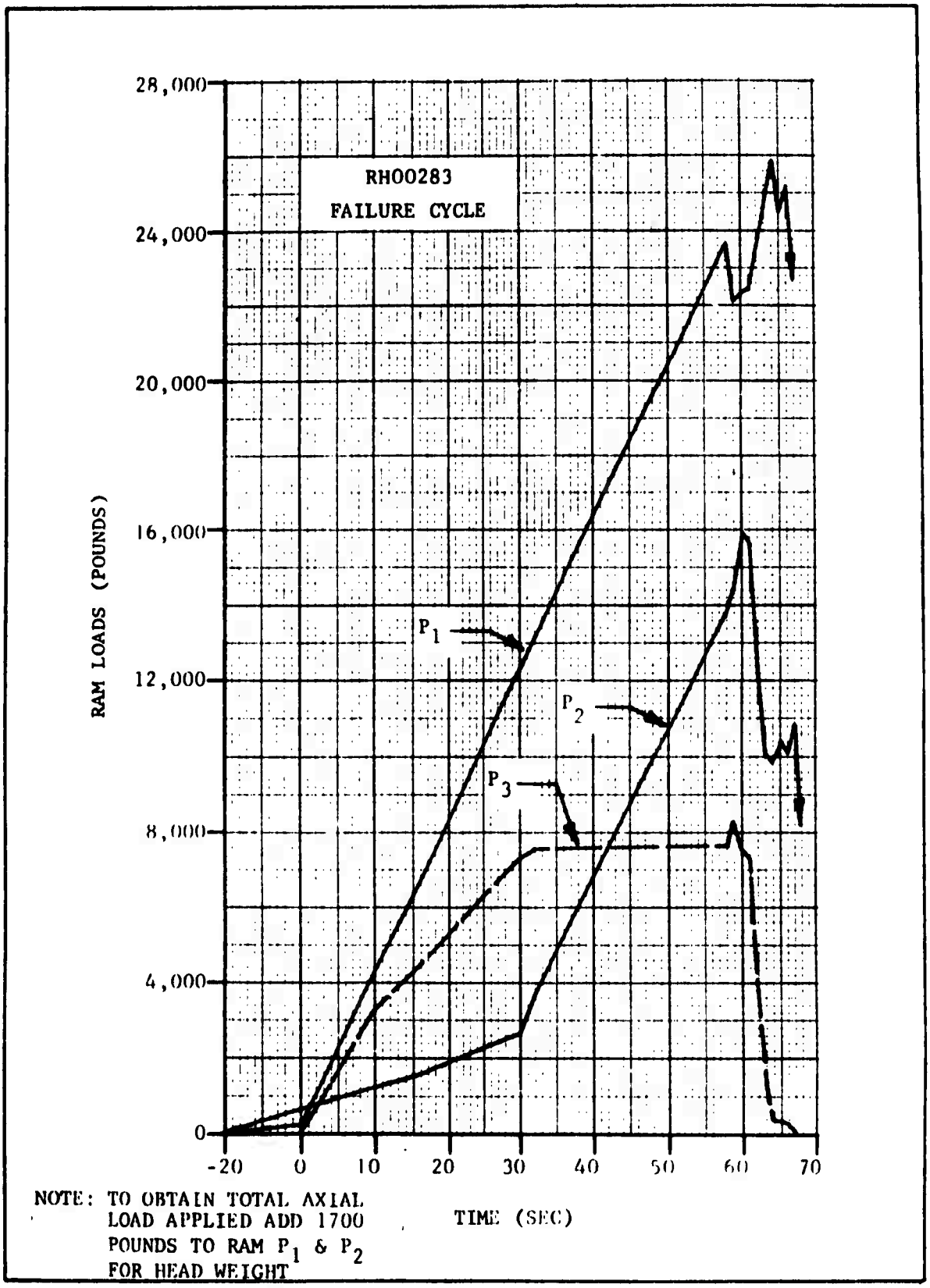


FIGURE 62 Actual Loads, Phase III, RH00283

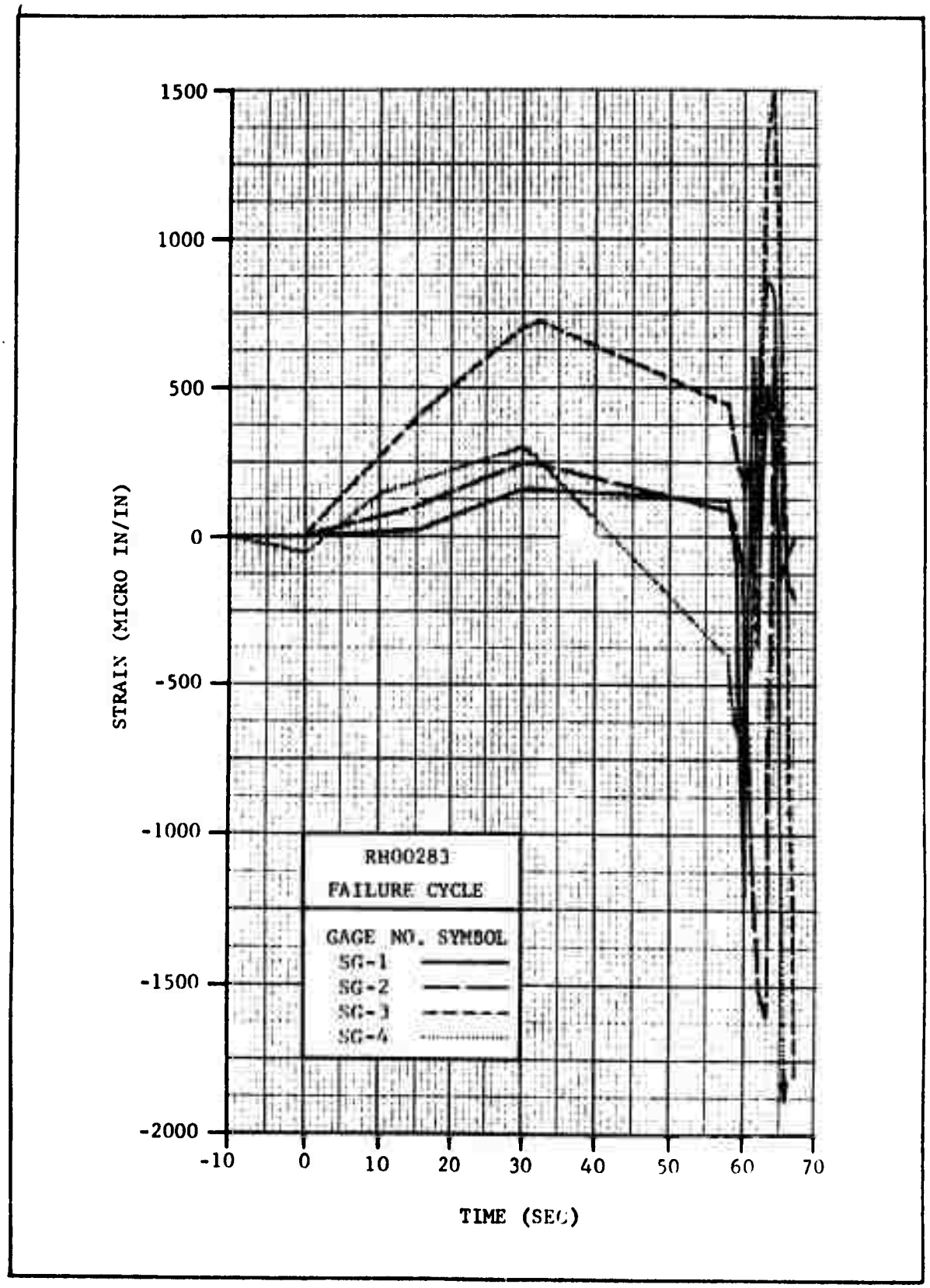


FIGURE 63 Strain Versus Time, Phase III, RH00283 Gages 1, 2, 3, and 4

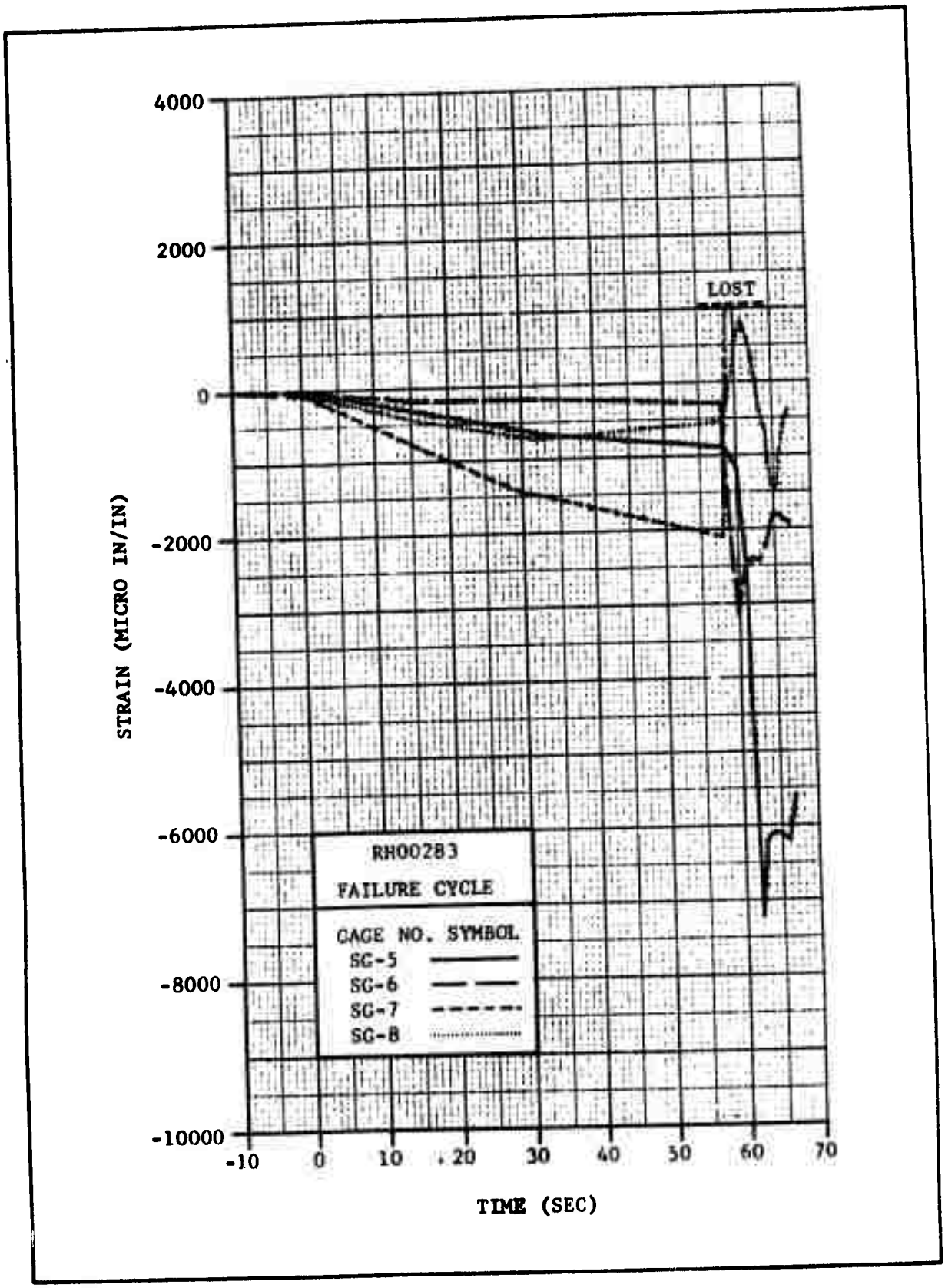


FIGURE 64 Strain Versus Time, Phase III, RH00283 Gages 5, 6, 7 and 8

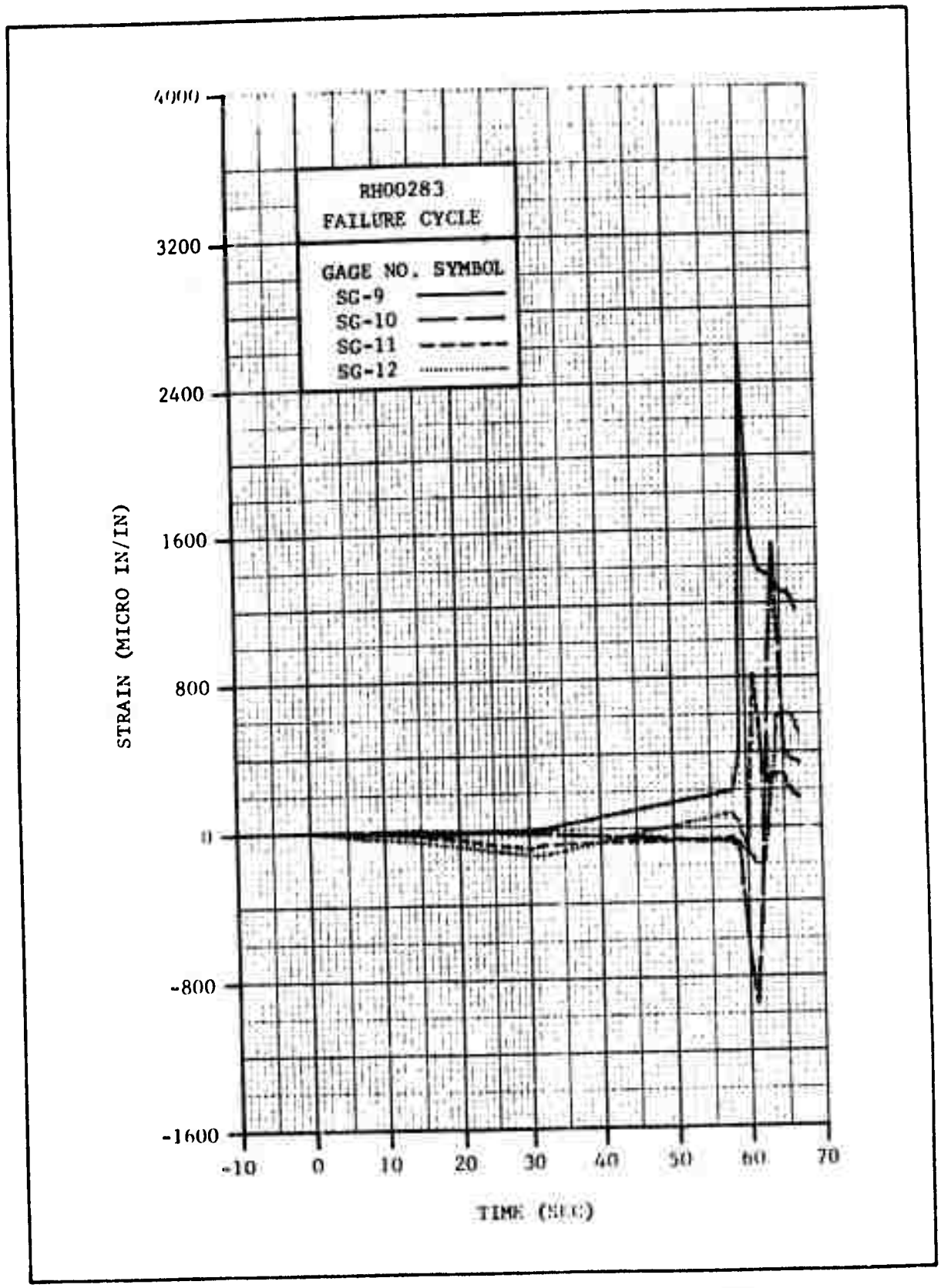


FIGURE 65 Strain Versus Time, Phase III, RH00283 Gages 9, 10, 11 and 12

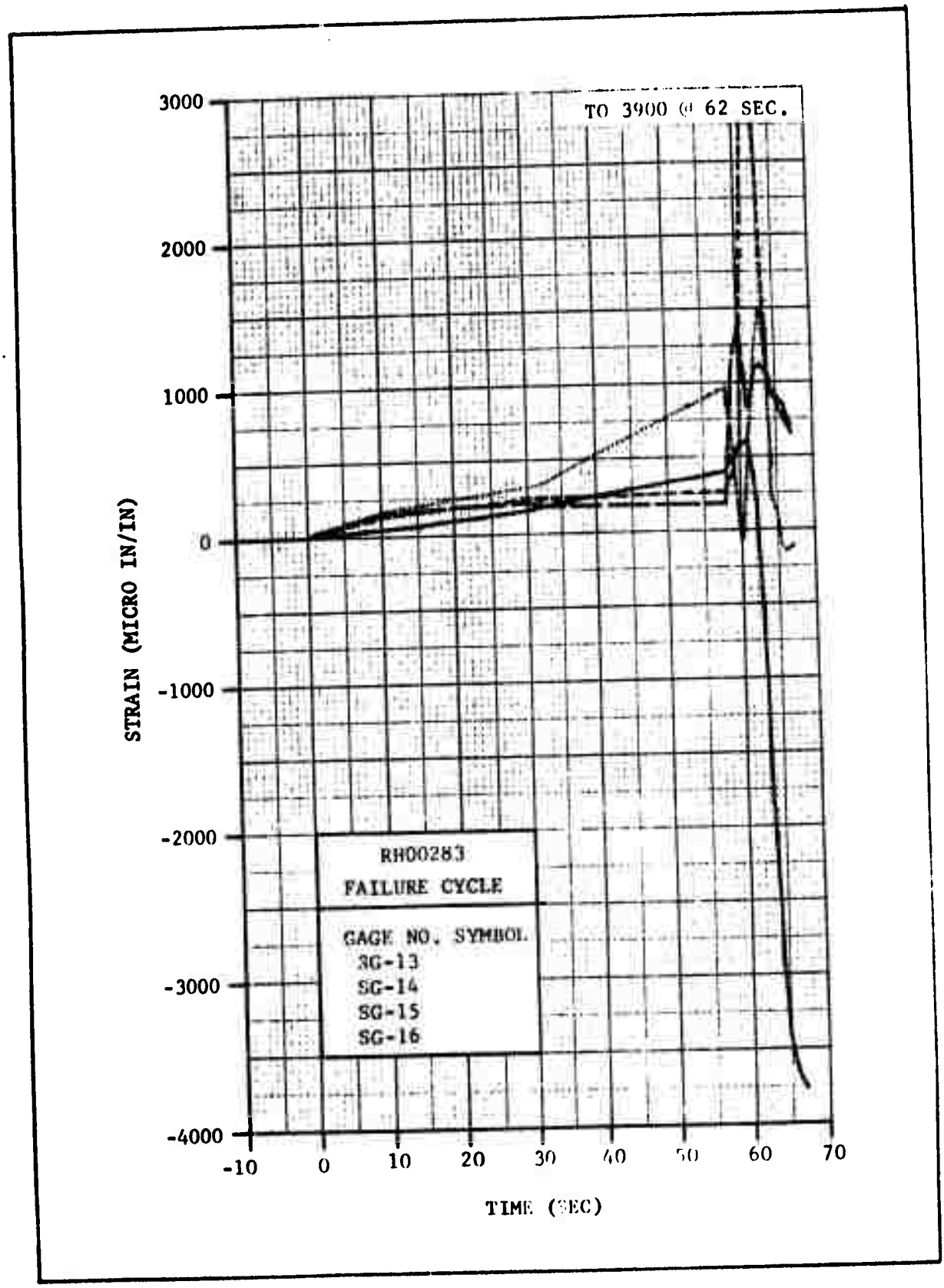


FIGURE 66 Strain Versus Time, Phase III, RH00283 Gages 13, 14, 15 and 16

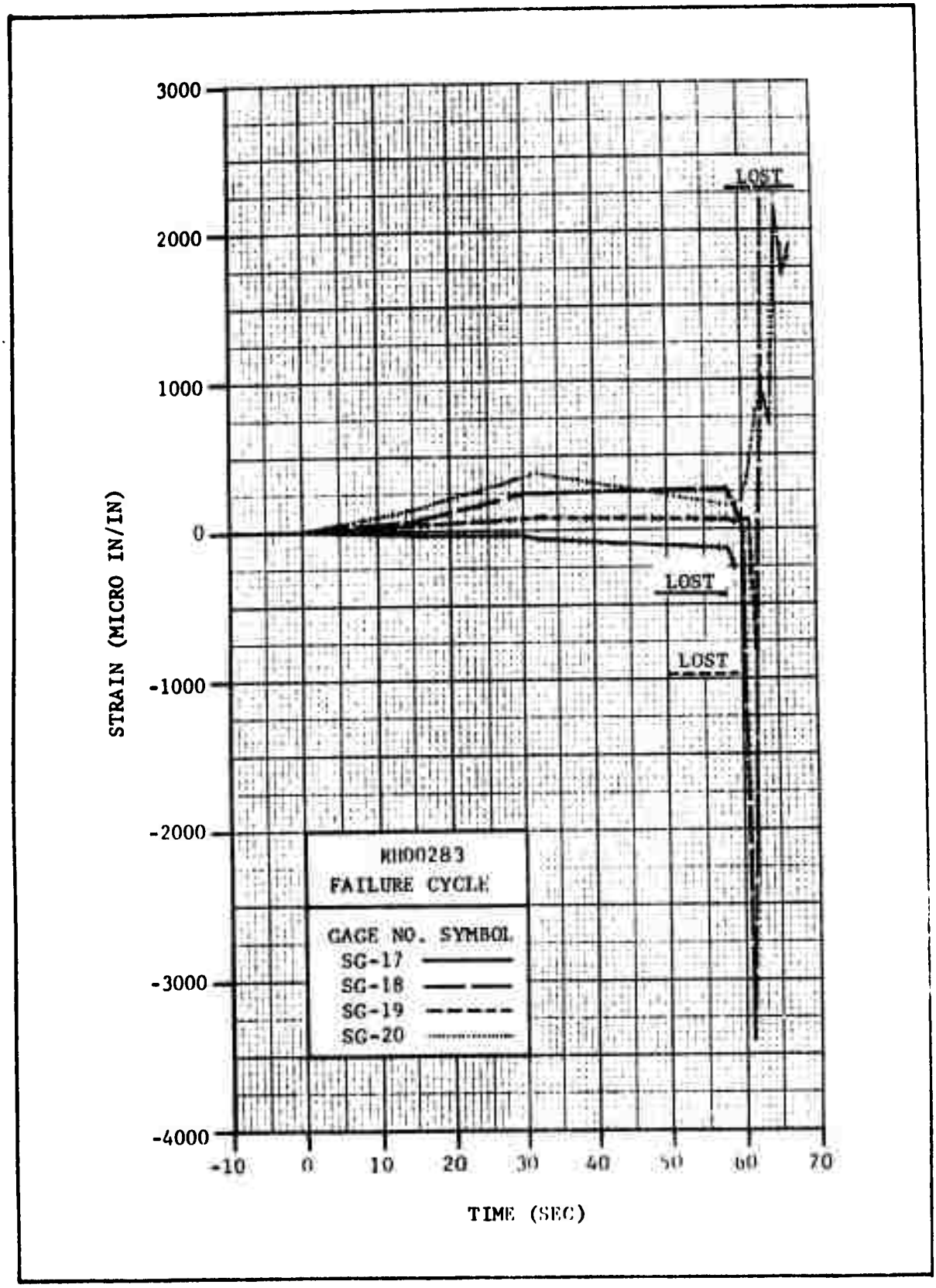


FIGURE 67 Strain Versus Time, Phase III, RH00283 Gages 17, 18, 19 and 20

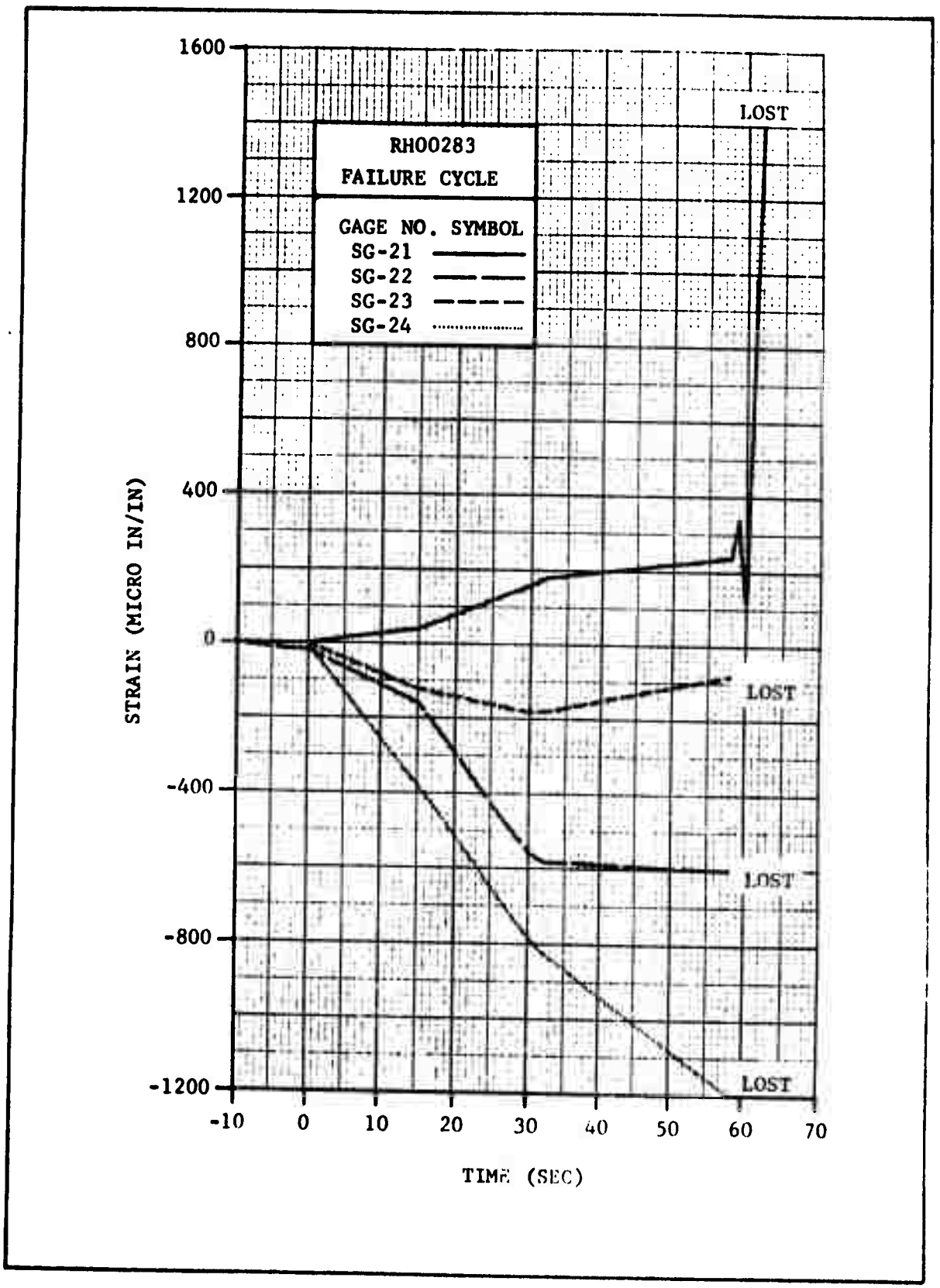


FIGURE 68 Strain Versus Time, Phase III, RH00283 Gages 21, 22, 23 and 24

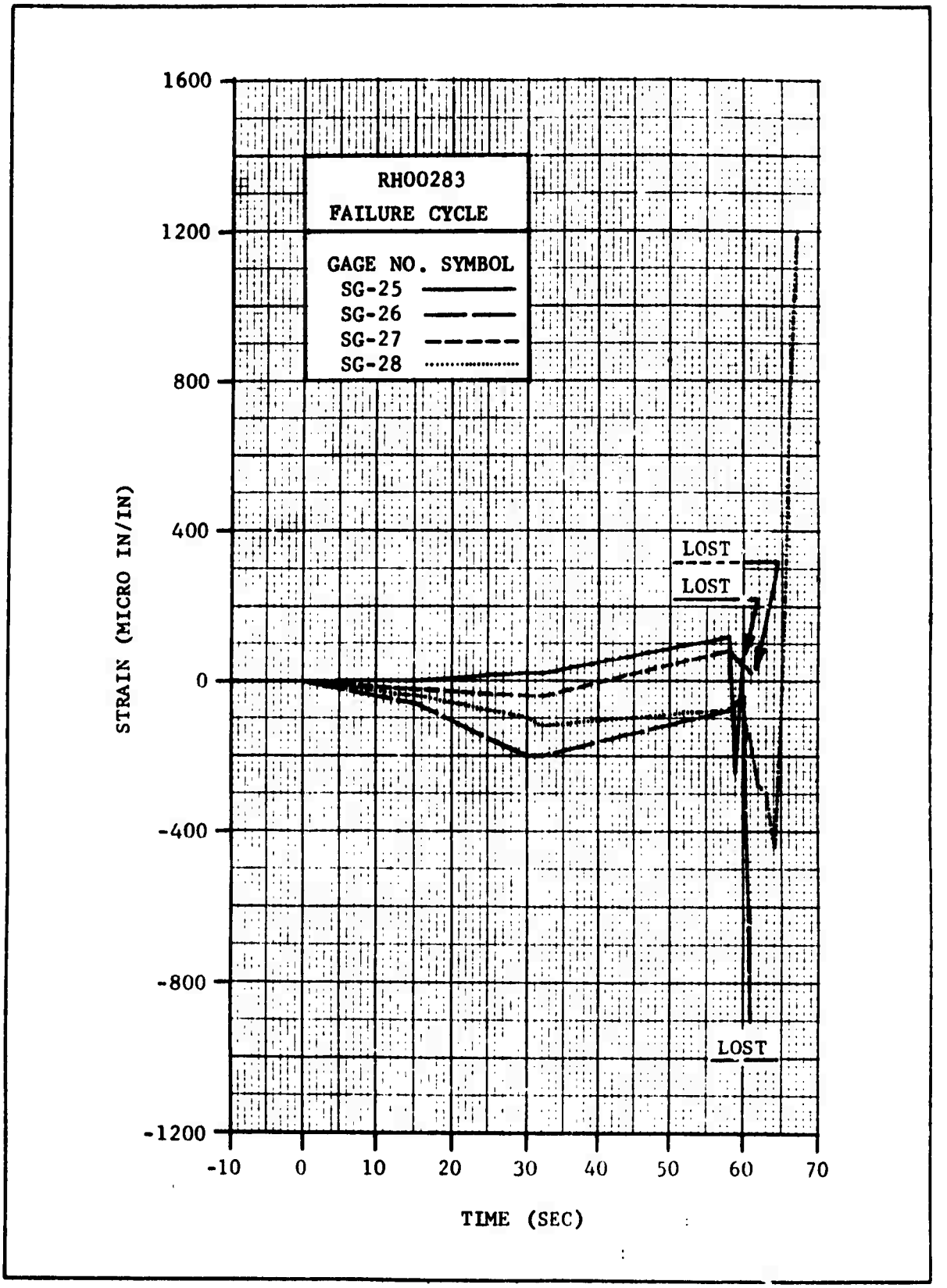


FIGURE 69 Strain Versus Time, Phase III, RH00283 Gages 25, 26, 27 and 28

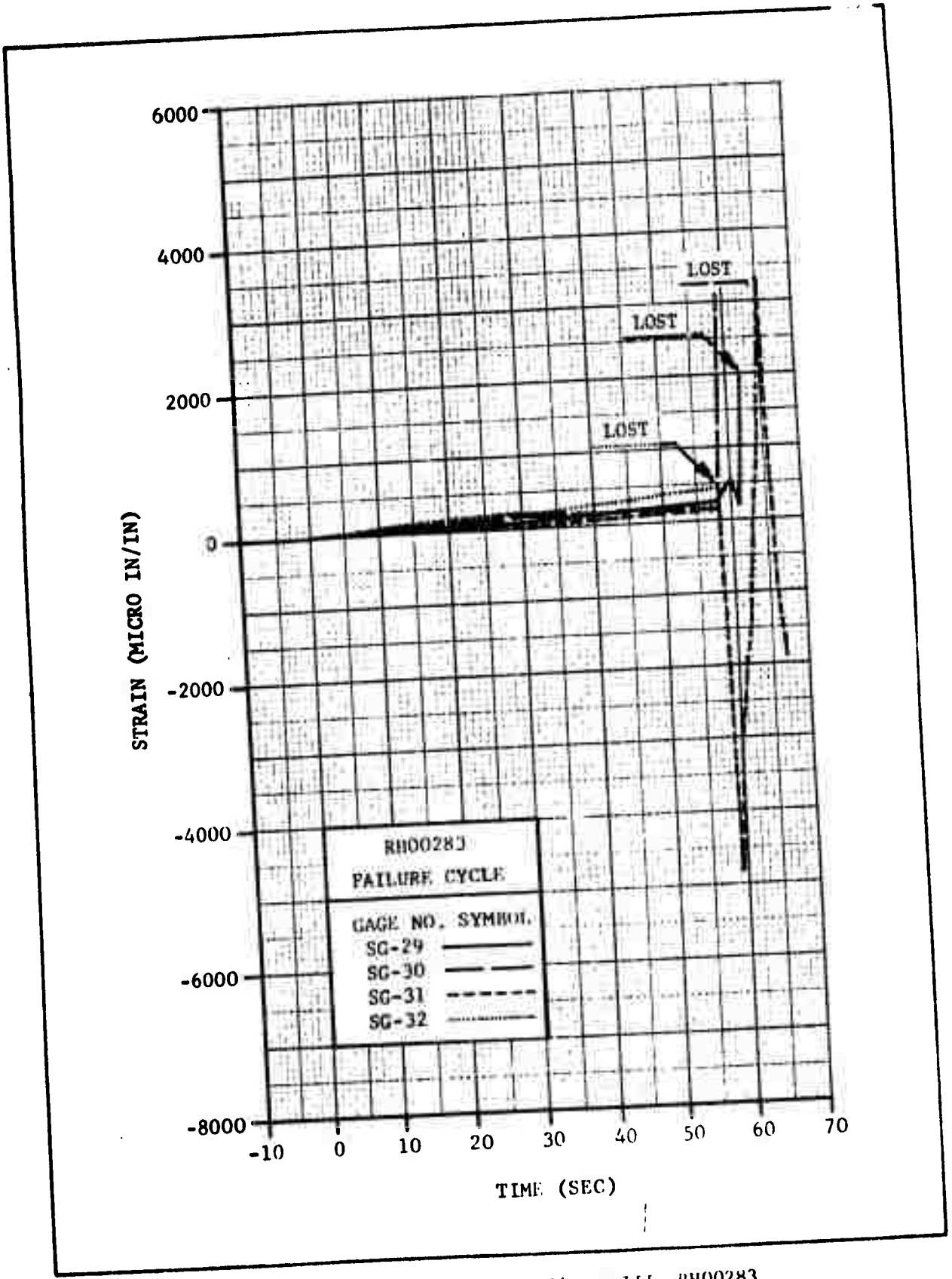


FIGURE 70 Strain Versus Time, Phase III, RH00283 Gages 29, 30, 31 and 32

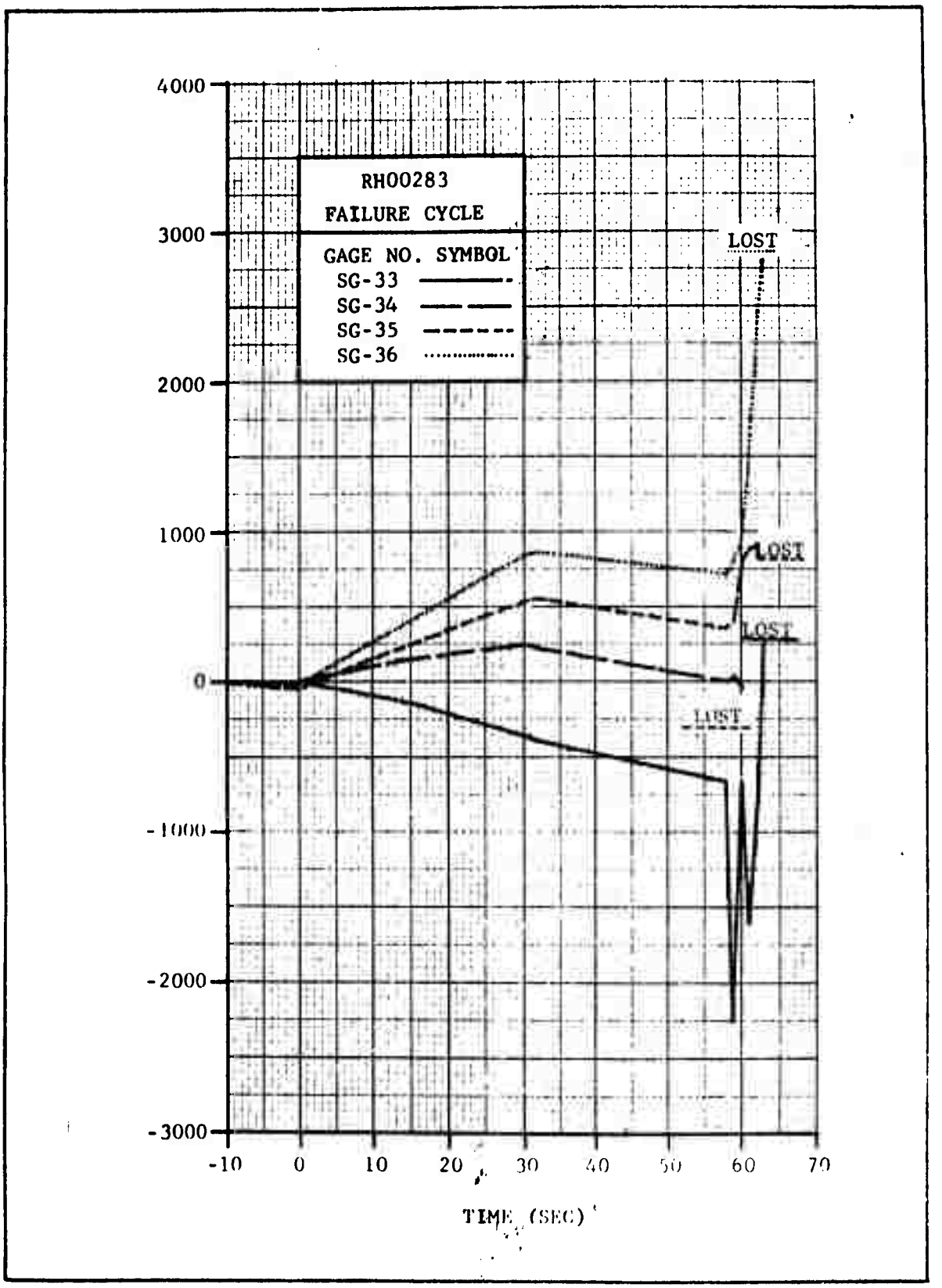


FIGURE 71 Strain Versus Time, Phase III, RH00283 Gages 33, 34, 35 and 36

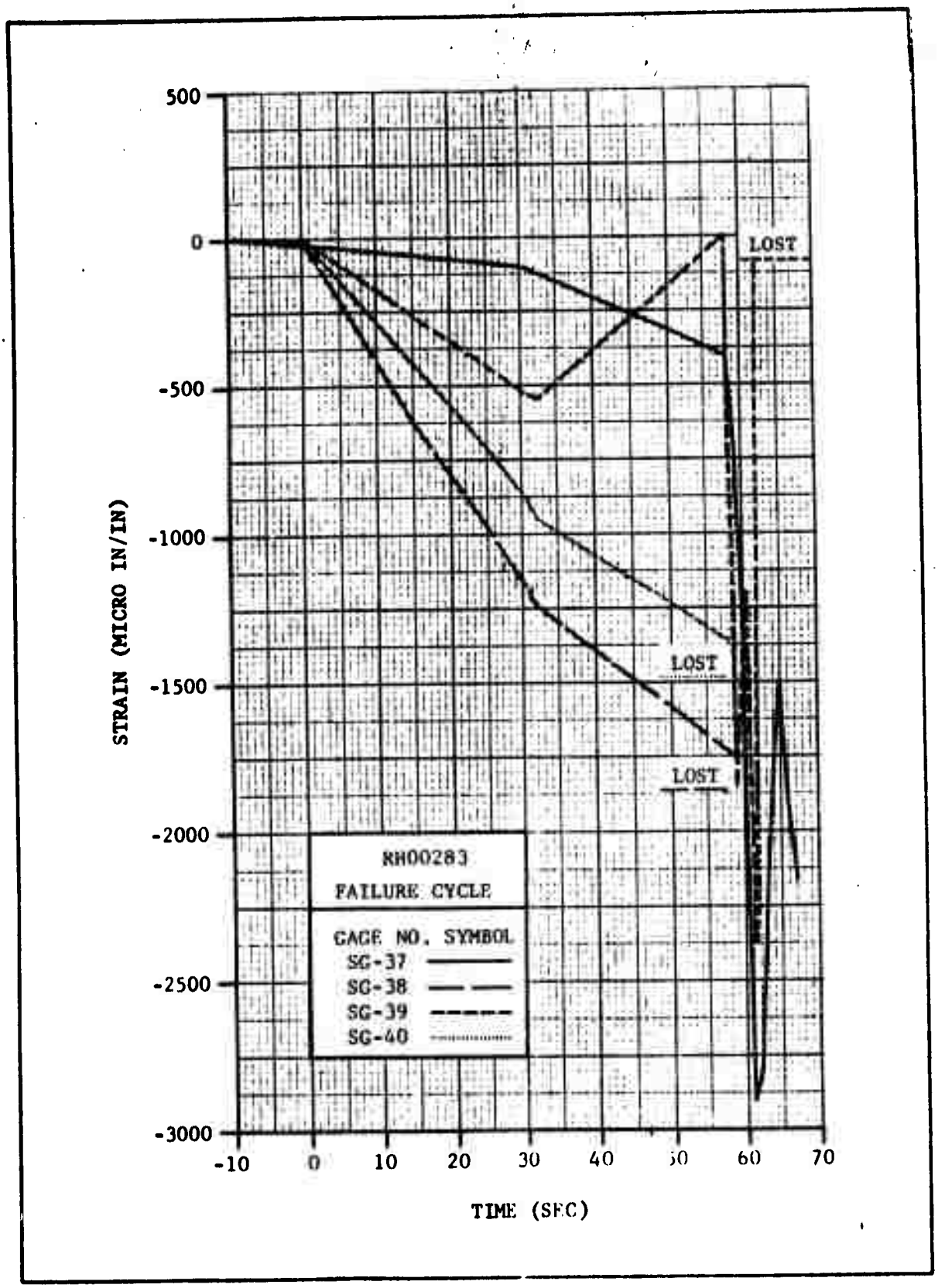


FIGURE 72 Strain Versus Time, Phase III, RH00283 Gages 37, 38, 39 and 40

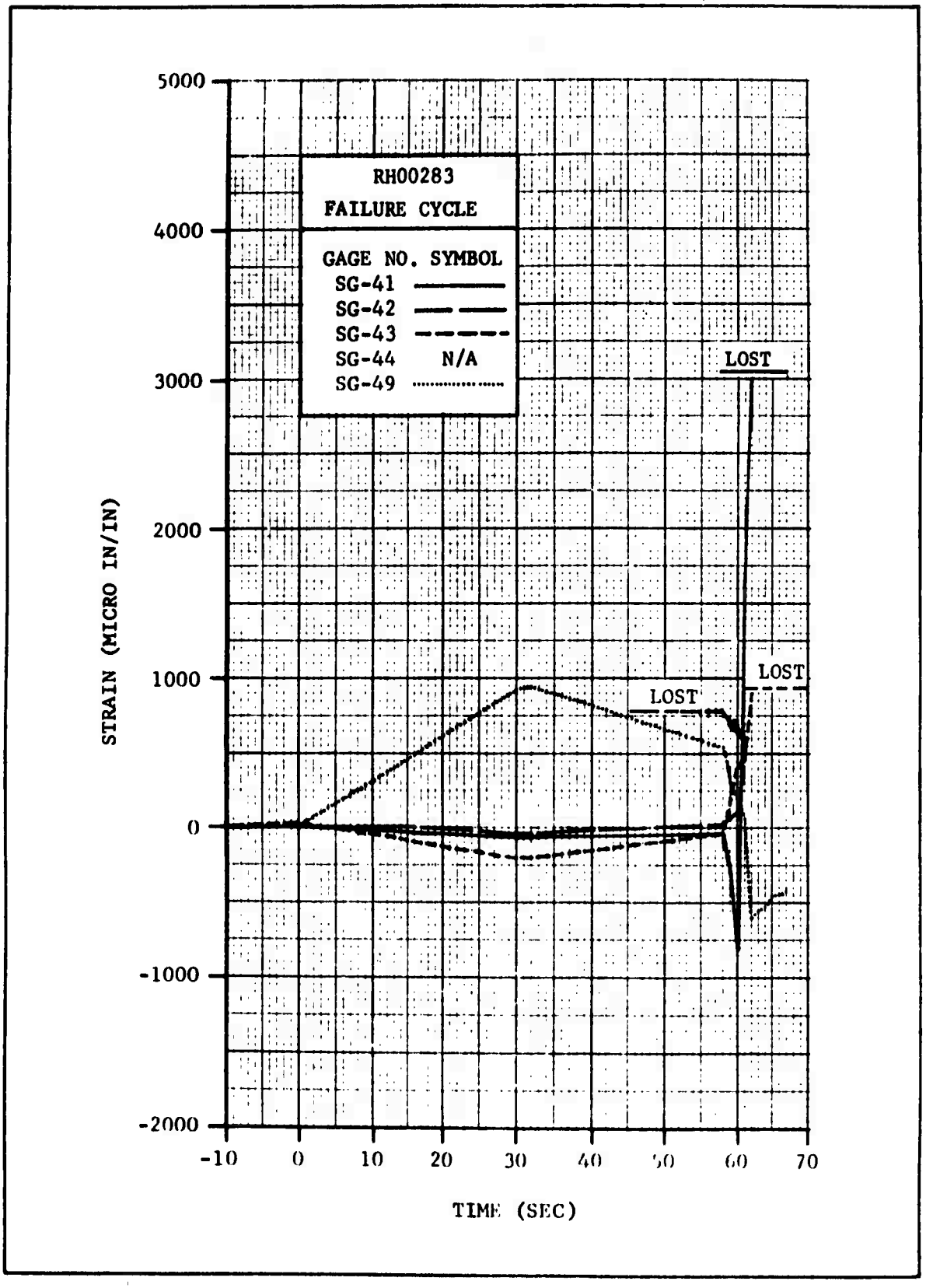


FIGURE 73 Strain Versus Time, Phase III, RH00283
Gages 41, 42, 43, 44 and 49

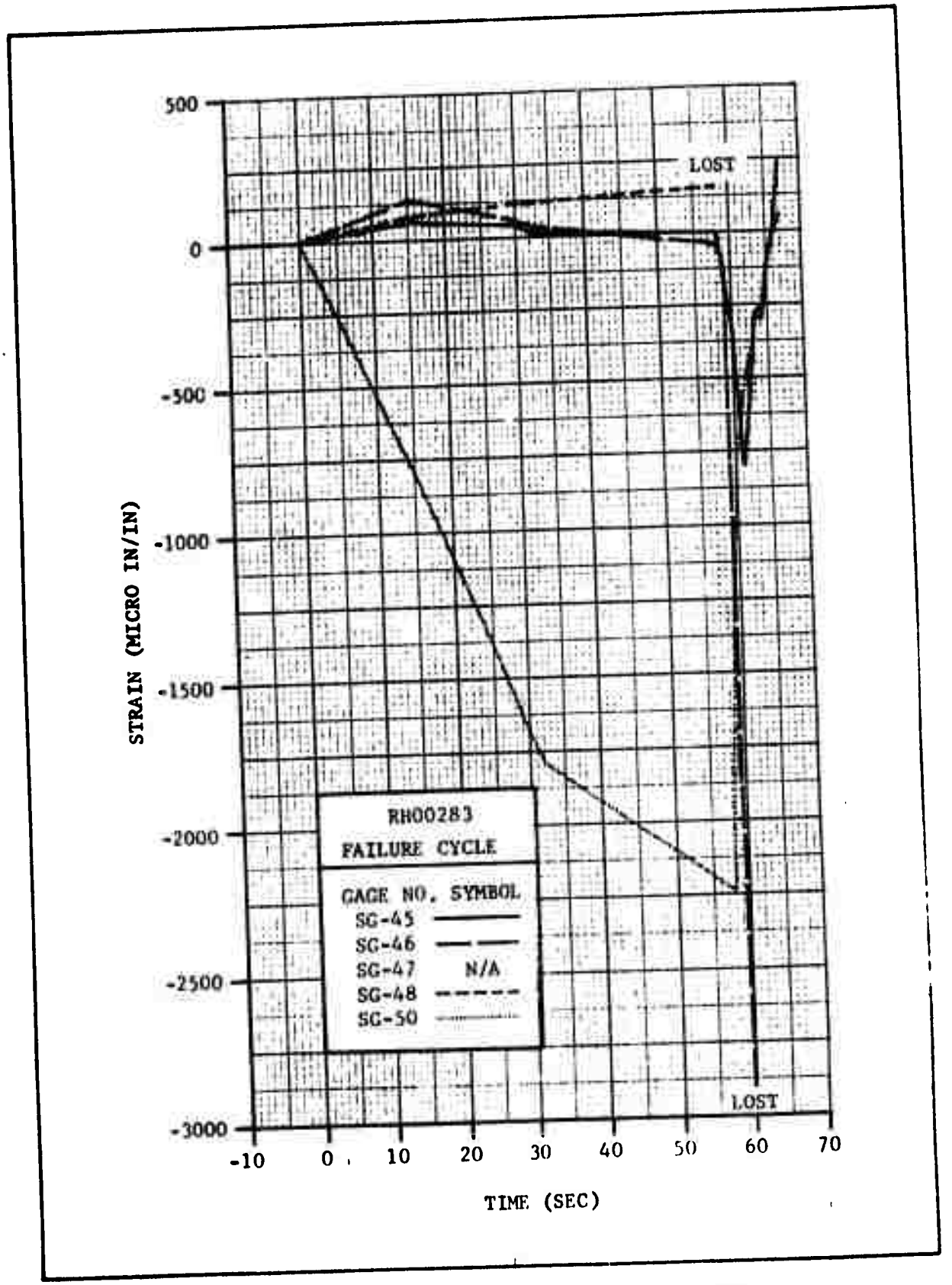


FIGURE 74 Strain Versus Time, Phase III, RH00283
Gages 45, 46, 47, 48 and 50

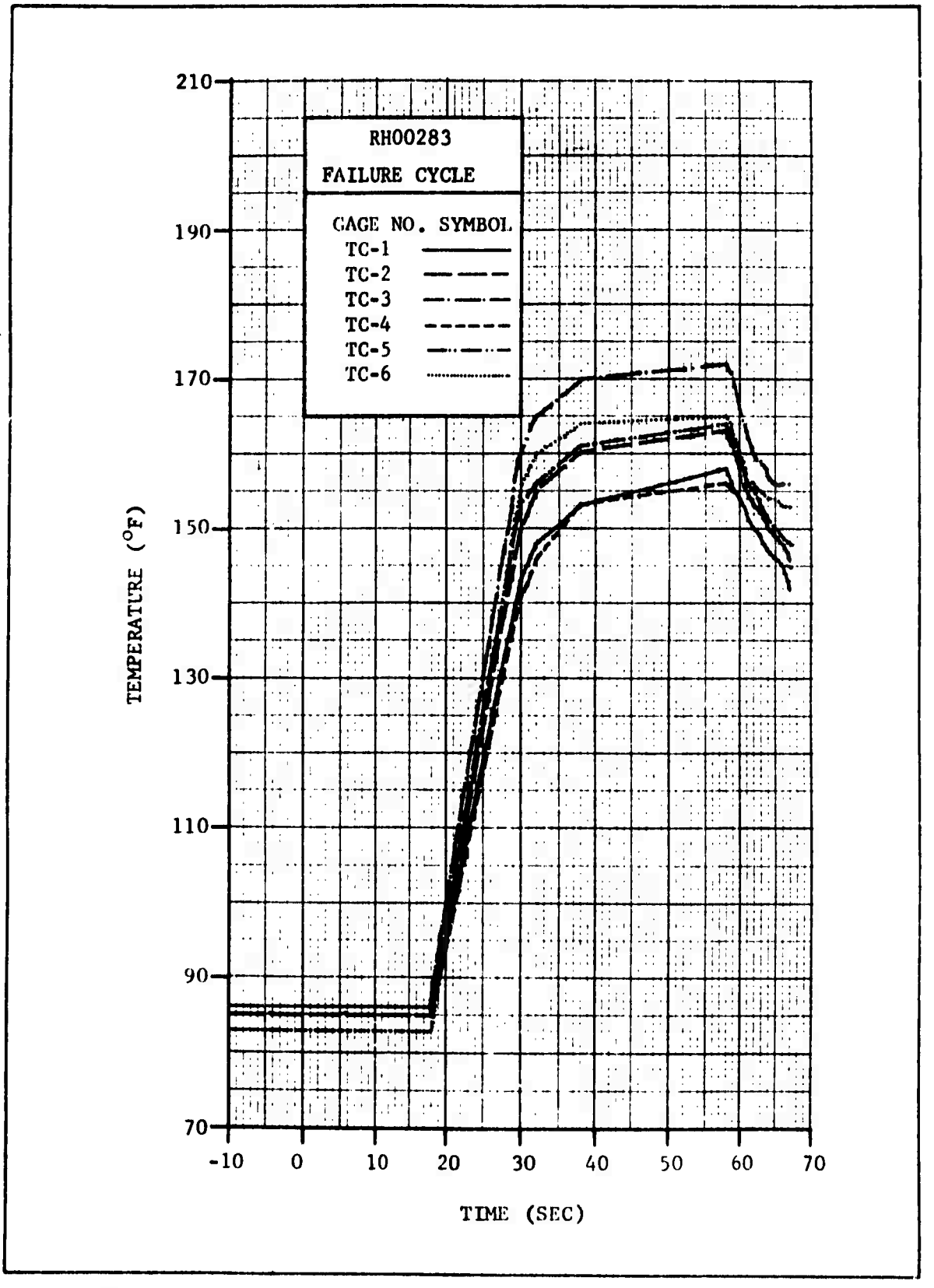


FIGURE 75 Temperature Versus Time, Phase III, RH00283 Gages 1, 2, 3, 4, 5 and 6

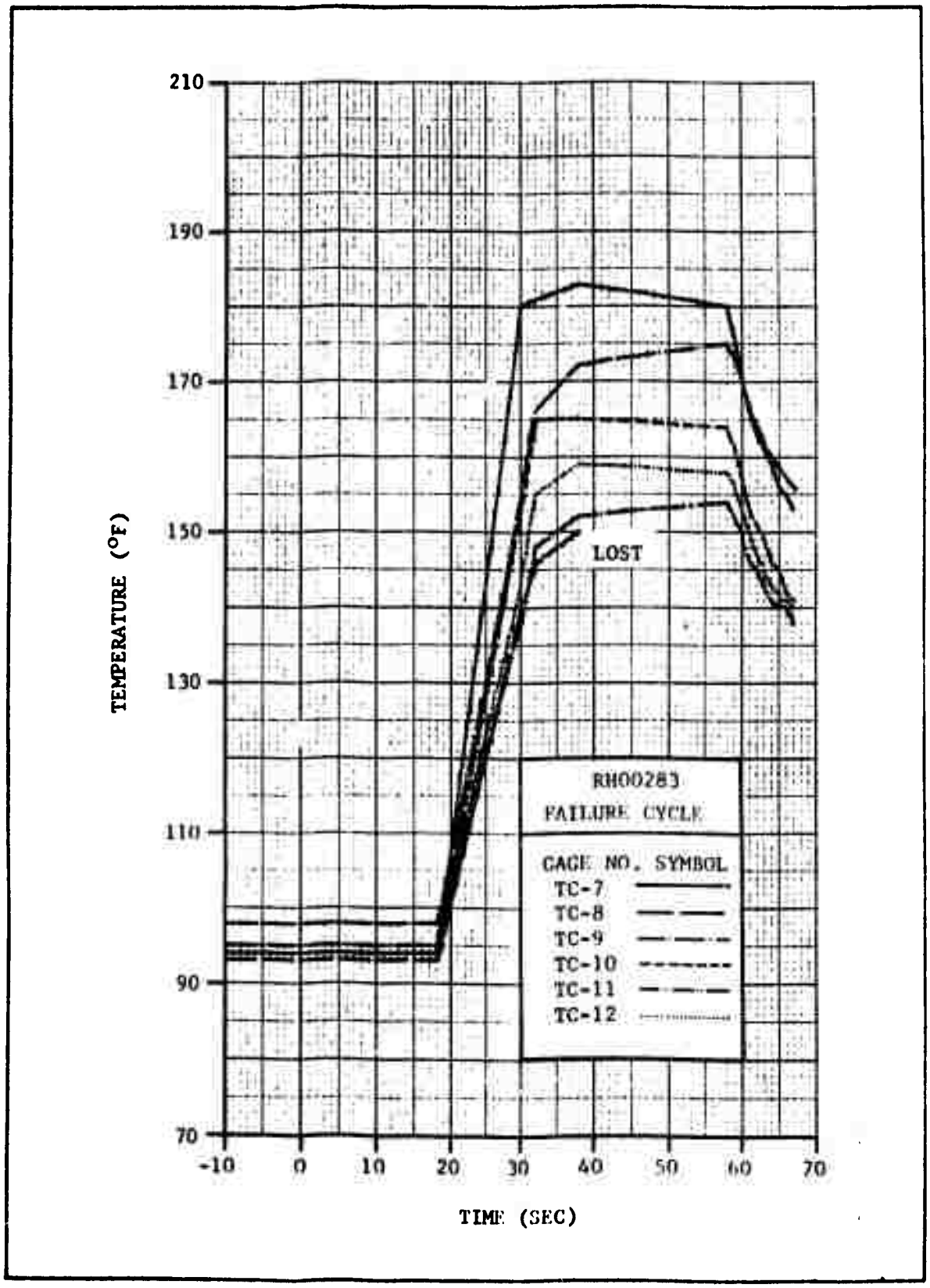


FIGURE 76 Temperature Versus Time, Phase III, RH00283 Gages 7, 8, 9, 10, 11 and 12

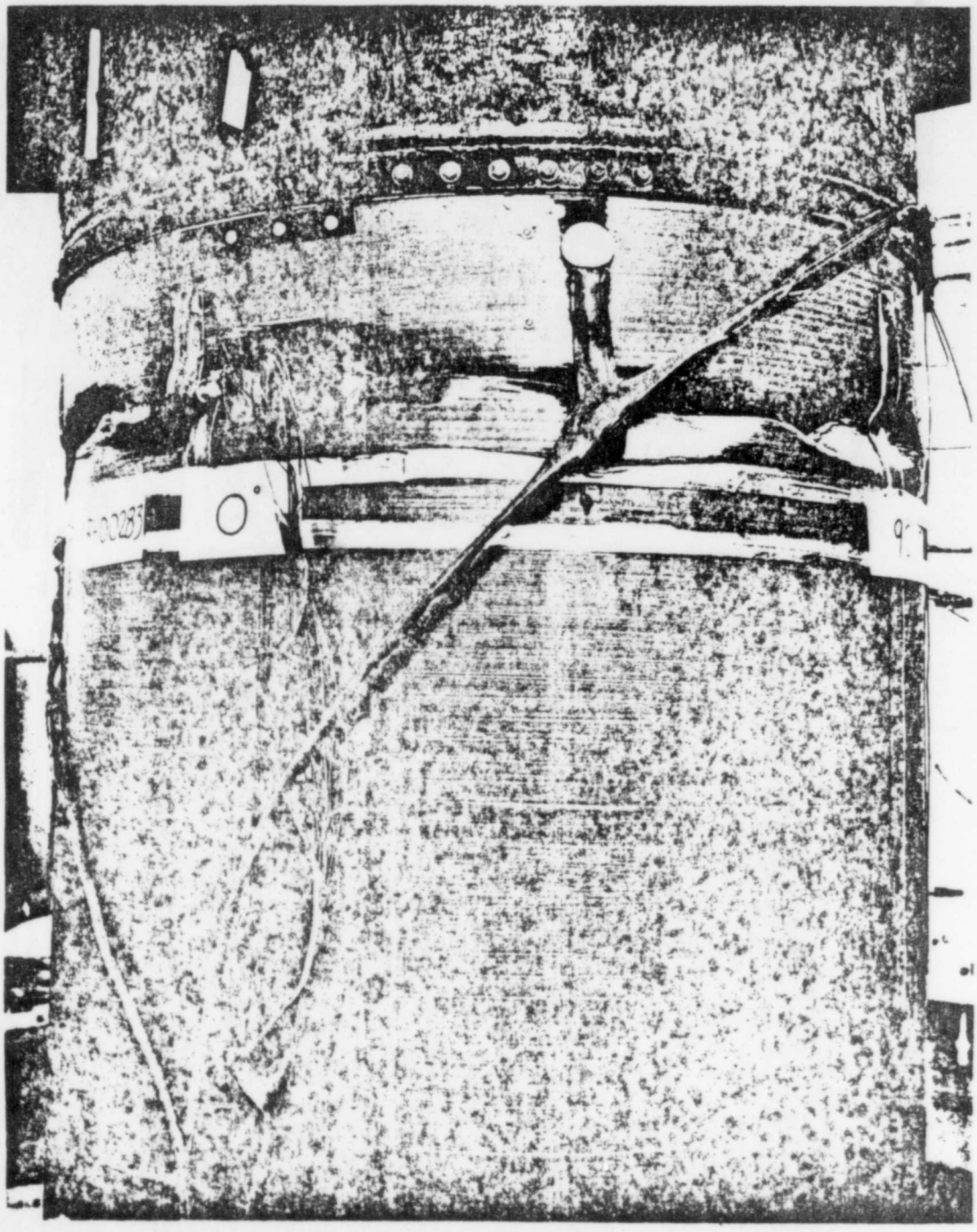


FIGURE 77 Failure Area 0°, Phase III, RH00283

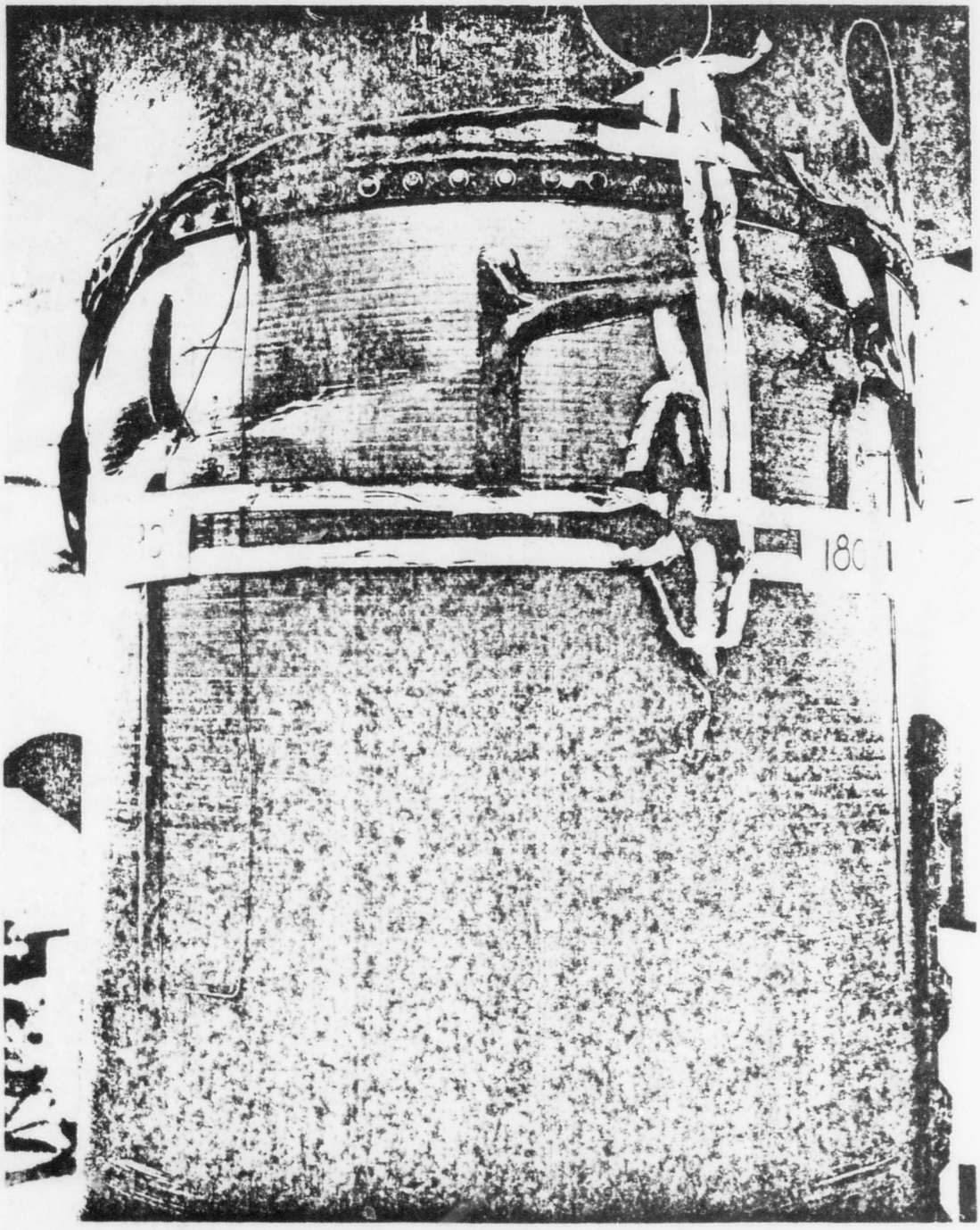


FIGURE 78 Failure Area 90°, Phase III, RH00283

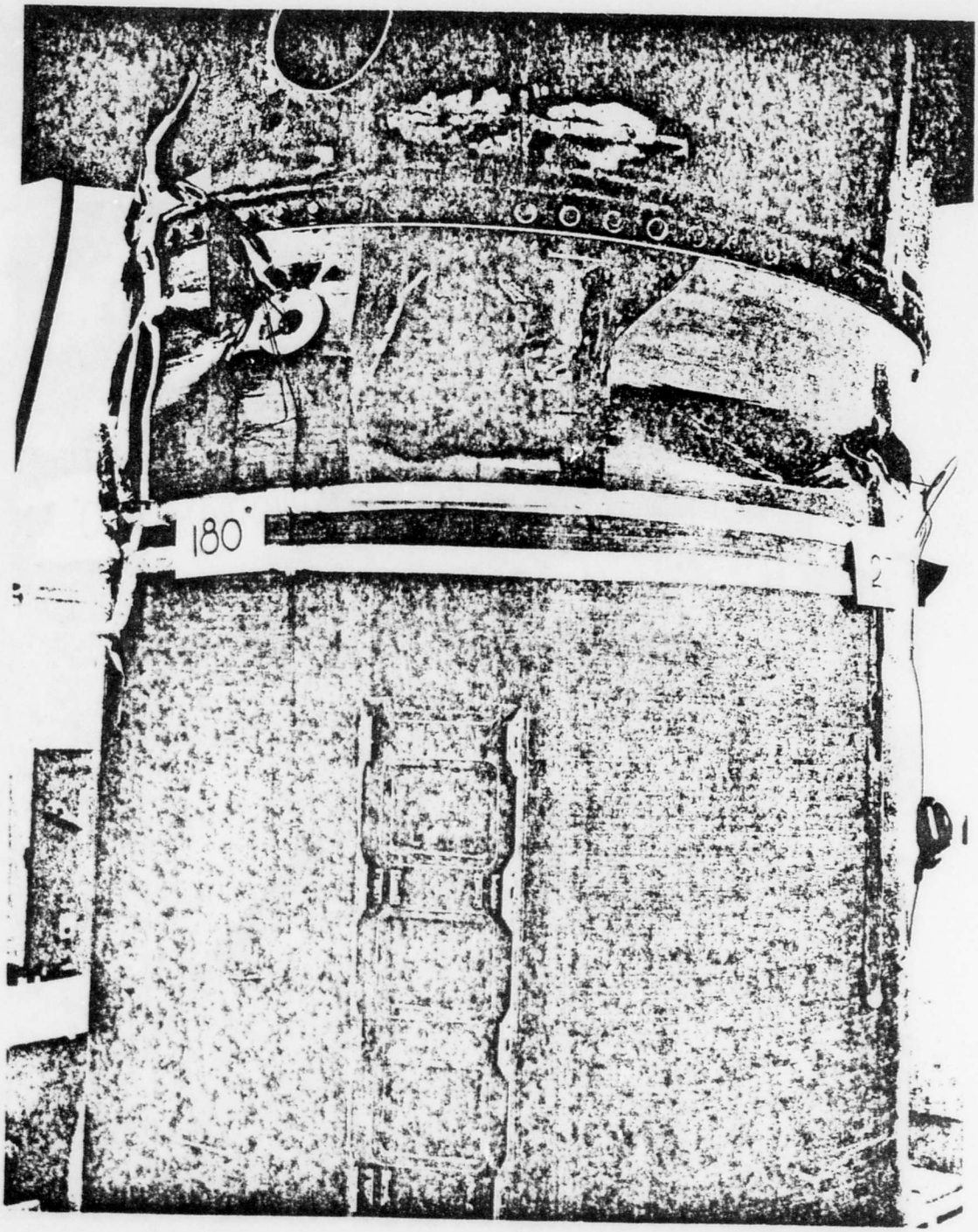


FIGURE 79 Failure Area 180°, Phase III, RH00283

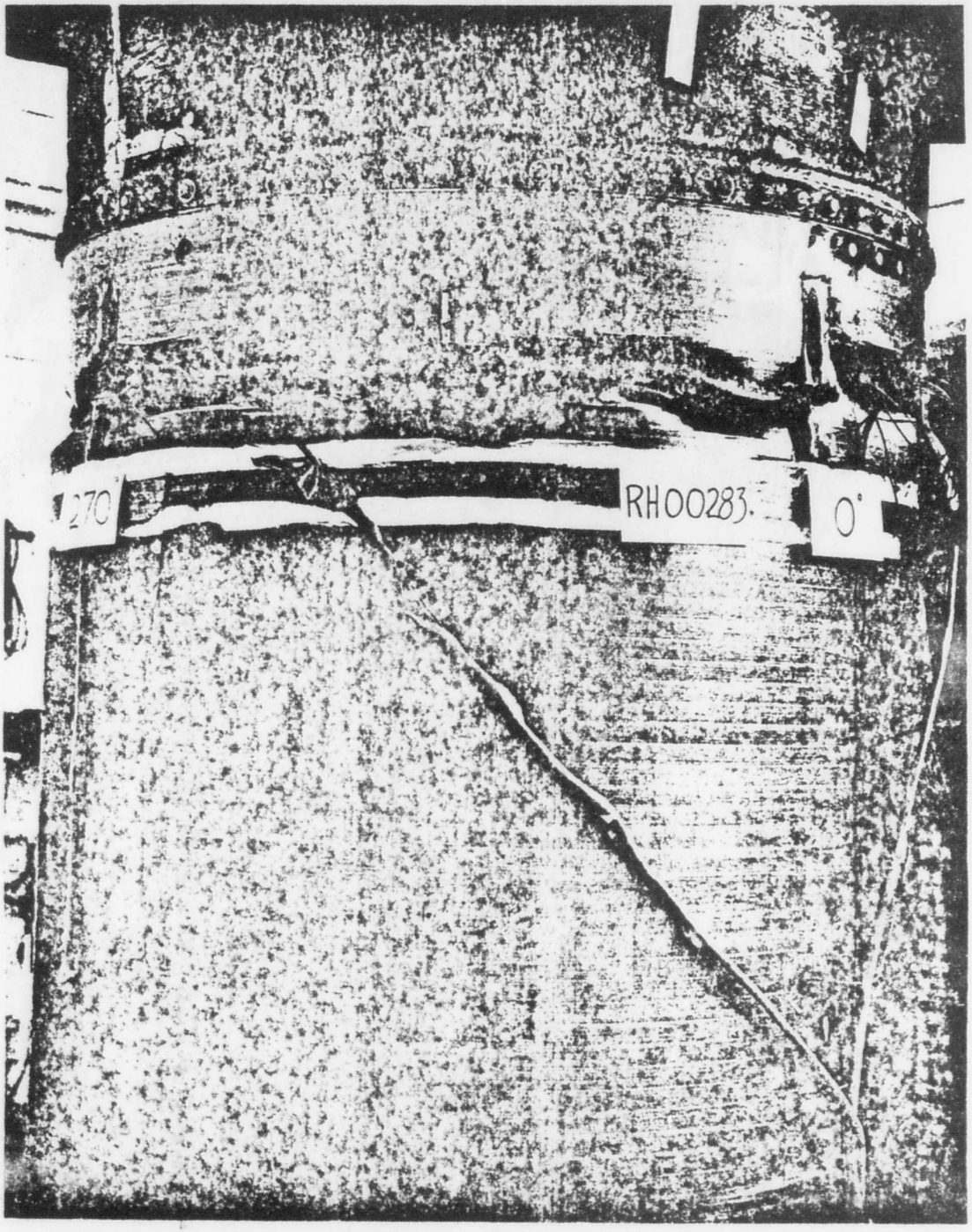


FIGURE 80 Failure Area 270°, Phase III, RH00283

TABLE I

N.C. MACHINE ROVING TENSION CHECK

CHANNEL	METER	BEFORE CUP TENSION	AFTER CUP TENSION	
1	3	3	4.25	FRN 6 and 25%
2	3.25	3.5	5	2 RPM of Mandrel
3	3.25	3.25	4.5	Secs/Rev. = 30
4	3.25	3.25	5	
7	3.25	3.25	4.75	
8	3.0	3.25	4.5	
11	3.25	3.5	5.5	
12	3	3	4.25	
13	3	3	4.0	
14	3.25	3.5	4.75	
1	3	3	5.00	FRN 6 and 50%
2	3	3	5.50	3.2 RPM of Mandrel
3	3.25	3.25	4.75	18 Secs/Rev.
4	3.25	3.25	5.25	
7	3.25	3.25	5.0	
8	3.0	3.25	4.75	
11	3.5	3.5	5.5	
12	3	3.25	4.5	
13	2.75	3	4.25	
14	3.25	3.5	5.25	
1	3.2	3.25	6	FRN 8 and 100%
2	3.2	3.25	6.5	15 RPM of Mandrel
3	3.25	3.5	6.25	Secs/Rev. = 5/22
4	3.5	3.75	6.75	
7	3.5	3.5	6.5	
8	3.2	3.25	6	
11	3.5	3.75	6.5	
12	3	3.25	6	
13	2.75	3	5.5	
14	3.5	3.5	6.5	
1	3.25	3.5	7.	FRM 12 and 100%
2	3.5	4.0	7.5	27-1/3 RPM
3	3.5	3.5	7.0	Rev/Sec. = 10/22
4	3.75	4.0	7.5	
7	3.5	3.5	7.0	
8	3.5	3.5	6.5	
11	3.5	4.0	7.0	
12	3.25	3.5	6.75	
13	3	3.25	6.5	
14	3.5	3.75	7.5	

(Cup plug pressure for all tests is 17-3/4 Psig.)

TABLE II

CAM CONTROLLED MACHINE ROVING TENSION CHECK

	BETWEEN FAIR LEAD EYE AND CUP		BETWEEN CUP AND UNIT	
SPINDLE NUMBER	1/2-SPEED RPM:....8	FULL-SPEED RPM:....14	1/2-SPEED RPM:....8	FULL-SPEED RPM:....14
1	4-1/2	3-1/4	4-3/4	5
2	3	3	4	4-3/4
3	2-1/4	2-1/2	3-1/2	3-3/4
4	3	3-1/4	4-3/4	5
5	3-1/2	3-1/2	5-3/4	5-1/2
6	3-1/4	3	4-1/4	4-1/2
7	3-1/4	2-3/4	4-1/4	4-1/4
8	3-1/2	2-3/4	3-1/2	3-1/2
9	2-1/2	2-1/2	4	4
10	3	3	4	4-1/2

TABLE III

FORWARD SKIRT THICKNESS W2SD-14A

SKIRT POSITION DEGREES	Distance from Forward Edge		
	3 INCHES	6 INCHES	9 INCHES
0	.155	.157	.161
15	.154	.157	.160
30	.153	.156	.160
45	.155	.156	.160
60	.153	.158	.163
75	.152	.156	.164
90	.154	.157	.163
105	.153	.156	.164
120	.154	.155	.163
135	.154	.155	.160
150	.153	.156	.160
165	.153	.156	.159
180	.158	.157	.160
195	.152	.152	.157
210	.154	.155	.160
225	.155	.156	.160
240	.156	.156	.165
255	.156	.156	.161
270	.157	.155	.160
285	.154	.155	.160
300	.155	.154	.161
315	.155	.154	.161
330	.156	.157	.162
345	.156	.155	.161

TABLE IV

FORWARD SKIRT THICKNESS RH00283

SKIRT POSITION DEGREES	Distance from Forward Edge		
	3 INCHES	6 INCHES	8.750
0	0.157	0.156	0.157
15	0.158	0.154	0.155
30	0.159	0.154	0.155
45	0.157	0.152	0.154
60	0.158	0.154	0.156
75	0.157	0.152	0.153
90	0.155	0.153	0.153
105	0.155	0.154	0.152
120	0.157	0.153	0.152
135	0.155	0.152	0.151
150	0.154	0.156	0.154
165	0.156	0.153	0.155
180	0.155	0.153	0.153
195	0.153	0.152	0.149
210	0.152	0.152	0.152
225	0.157	0.154	0.153
240	0.164	0.160	0.162
255	0.155	0.151	0.153
270	0.158	0.153	0.154
285	0.156	0.153	0.152
300	0.157	0.153	0.153
315	0.155	0.152	0.155
330	0.158	0.153	0.154
345	0.157	0.155	0.157

TABLE V
W2SD-14A PHASE I
STRAIN AND DEFLECTION

GAGE NO.	TIME (SEC.)							
	0	10	13	15	20	30	40	60
	RAM LOADS (POUNDS)							
P1	0	4352	5548	6174	8649	12238	12283	1150
P2	0	820	1060	1428	1640	2516	2535	276
P3	0	2492	3091	4153	5051	7490	7527	133
	STRAIN (MICRO IN/IN)							
SG-1	0	- 40	- 30	- 20	- 50	0	20	- 20
SG-2	0	- 20	- 30	- 40	- 40	- 80	- 80	- 70
SG-3	0	- 10	- 10	0	30	80	110	20
SG-4	0	- 20	- 20	- 30	- 40	- 60	- 70	- 40
SG-5	0	60	80	130	230	360	400	130
SG-6	0	- 20	- 30	- 40	- 50	- 80	- 80	- 30
SG-7	0	70	100	170	280	400	420	20
SG-8	0	- 20	- 20	- 30	- 70	- 80	- 100	- 20
SG-9	0	70	100	160	230	350	400	160
SG-10	0	0	0	0	- 10	- 20	- 30	- 10
SG-11	0	0	10	40	20	40	60	- 70
SG-12	0	- 10	- 20	- 30	- 40	- 70	- 70	30
SG-13	0	- 50	- 90	- 140	- 240	- 340	- 340	- 130
SG-14	0	30	20	10	- 10	- 40	- 50	20
SG-15	0	- 130	- 180	- 260	- 350	- 500	- 530	30
SG-16	0	20	40	70	80	120	120	- 2[illegible]
SG-17	0	- 80	- 120	- 170	- 230	- 370	- 380	- 20
SG-18	0	- 10	- 10	- 20	- 20	- 20	- 10	0
SG-19	0	- 130	- 180	- 260	- 360	- 610	- 670	- 180
SG-20	0	30	40	50	60	120	120	30
SG-21	0	- 10	- 140	- 180	- 280	- 420	- 430	- 200

(-) Negative Sign Indicates Compression

TABLE V (Cont.)
W8SU-14A PHASE I
STRAIN AND DEFLECTION

GAGE NO.	TIME (SEC.)							
	0	10	13	15	20	30	40	60
STRAIN (MICRO IN/IN)								
SG-22	0	60	60	70	90	130	130	100
SG-23	0	- 80	- 100	- 130	- 190	- 280	- 280	- 120
SG-24	0	40	60	80	120	140	130	80
SG-25	0	- 30	- 30	- 50	- 70	- 110	- 110	- 30
SG-26	0	- 20	0	10	30	130	170	30
DEFLECTION (INCHES)								
ED1-1	0	-.0002	-.0006	-.0006	-.0012	-.0010	-.0010	-.0004
ED1-2	0	.0012	.0014	.0026	.0040	.0044	.0046	.0016
ED1-3	0	-.0012	-.0016	-.0020	-.0028	-.0036	-.0036	-.0016
ED1-4	0	-.0024	-.0034	-.0054	-.0072	-.0112	-.0114	-.0004

(-) Negative Sign Indicates Compression

TABLE VI

W2SD-14A PHASE II

STRAIN AND DEFLECTION

GAGE NO.	TIME (SEC.)													
	0	3	5	6	8	10	18	19	20	40	60	80	84	85
	AXIAL LOAD (POUNDS)													
AXIAL	0	755	828	3003	2413	5250	6356	6724	7092	15013	22382	29936	31317	31778
	OVERPRESSURE (PSIG)													
O.P.	0	.60	4.01	6.02	6.02	6.22	9.03	10.84	11.44	20.27	30.11	30.11	29.90	29.90
	STRAIN (MICRO IN/IN)													
SG-1	0	10	30	70	80	30	30	40	50	70	100	100	100	100
SG-2	0	- 30	- 170	- 320	- 370	- 370	- 580	- 670	- 720	-1400	-2220	-2230	-2200	-2200
SG-3	0	0	20	60	80	30	50	70	80	80	130	120	120	110
SG-4	0	- 10	- 100	- 200	- 280	- 280	- 430	- 510	- 570	-1100	-1760	-1770	-1740	-1730
SG-5	0	20	60	100	140	80	70	80	80	60	30	- 10	- 120	- 130
SG-6	0	- 30	- 120	- 260	- 300	- 300	- 470	- 550	- 580	-1100	-1780	-1880	-1870	-1870
SG-7	0	0	10	50	100	0	- 20	- 20	- 20	- 80	- 140	- 300	- 330	- 340
SG-8	0	- 50	- 170	- 300	- 370	- 360	- 540	- 650	- 670	-1270	-2130	-2330	-2330	-2340
SG-9	0	0	30	80	100	0	- 10	- 10	- 10	- 60	- 130	- 350	- 400	- 420
SG-10	0	- 40	- 170	- 300	- 300	- 290	- 430	- 530	- 540	-1030	-1670	-1790	-1790	-1800
SG-11	0	10	30	80	90	30	40	50	60	60	60	- 30	- 40	- 50
SG-12	0	- 30	- 150	- 270	- 280	- 290	- 450	- 540	- 550	-1080	-1770	-1830	-1810	-1820
SG-13	0	10	30	30	40	10	20	30	30	20	10	0	0	- 10
SG-14	0	- 50	- 160	- 320	- 340	- 350	- 560	- 670	- 690	-1330	-2100	-2140	-2130	-2120

(-) Negative Sign Indicates Compression

TABLE VI (Cont.)
W25D-14A PHASE II
STRAIN AND DEFLECTIONS

GAGE NO.	TIME (SEC.)													
	86	87	88	89	90	100	103	104	105	107	108	109	120	126
	AXIAL LOAD (POUNDS)													
AXIAL	32239	32606	32883	33067	33520	37305	38318	38594	39177	39884	40621	41173	45042	47216
	OVERPRESSURE (PSIG)													
O.P.	29.90	29.90	29.90	29.90	29.90	30.11	30/11	30.11	29.90	28.70	29.90	30.31	30.11	29.90
	STRAIN (MICRO IN/IN)													
SG-1	100	100	100	100	100	80	80	80	80	70	70	80	70	40
SG-2	-2200	-2200	-2200	-2200	-2210	-2230	-2260	-2260	-2230	-2110	-2180	-2240	-2200	-2100
SG-3	100	110	100	100	100	80	70	70	70	20	30	20	- 30	- 40
SG-4	-1720	-1730	-1730	-1740	-1750	-1770	-1780	-1780	-1780	-1670	-1700	-1790	-1580	-1400
SG-5	- 140	- 160	- 170	- 180	- 190	- 240	- 270	- 280	- 300	- 400	- 410	- 420	- 190	0
SG-6	-1880	-1880	-1900	-1910	-1920	-2070	-2150	-2210	-2290	-2750	-3200	-3650 @ 108.5 Sec.)		
SG-7	- 350	- 360	- 370	- 380	- 390	- 480	- 500	-500	- 510	- 500	- 470	- 420	- 260	- 180
SG-8	-2370	-2400	-2420	-2440	-2450	-2870	-3130	-3350	-3750	(-5350 @ 106 Sec.)	-----			
SG-9	- 430	- 450	- 460	- 470	- 480	- 600	- 670	- 700	- 800	- 920	- 910	- 930	-1080	-1150
SG-10	-1810	-1830	-1840	-1870	-1900	-2230	-2450	-2650	-3500	-5700	Lost ----	-----		
SG-11	- 60	- 70	- 80	- 80	- 90	- 120	- 160	- 170	- 210	- 310	- 400	- 440	- 460	- 430
SG-12	-1820	-1830	-1840	-1850	-1870	-1980	-2050	-2100	-2280	-2700	-3600	Lost ----	-------	
SG-13	- 10	- 10	- 10	- 10	- 20	- 20	- 10	- 20	- 20	- 20	- 20	- 20	- 30	- 30
SG-14	-2130	-2140	-2130	-2140	-2150	-2170	-2180	-2180	-2160	-2100	-2240	-2230	-2160	-2080

(-) Negative Sign Indicates Compression

TABLE VI (Cont.)
W2SD-14A PHASE II
STRAIN AND DEFLECTION

GAGE NO.	TIME (SEC.)													
	130	134	140	141	142	143	146	147	147.5	148	151	160	163	164
	AXIAL LOAD (POUNDS)													
AXIAL	48450	49187	51121	51397	51342	51361	53516	53884	53884	53976	54805	58029	59319	58950
	OVERPRESSURE (PSIG)													
O.P.	29.70	29.50	29.50	29.70	29.10	29.30	30.51	30.11	29.90	29.70	29.50	29.30	29.30	28.50
	STRAIN (MICRO IN/IN)													
SG-1	30	30	30	20	10	0	- 30	- 30	- 30	- 30	- 30	- 20	- 20	- 10
SG-2	-2100	-2080	-2070	-2080	-2100	-2210	-3180	-3100	-3080	-3070	-3000	-3150	-3130	-2950
SG-3	- 50	- 60	- 70	- 70	- 70	- 80	- 40	- 30	- 30	- 30	- 20	0	10	0
SG-4	-1300	-1200	-1040	-1042	- 980	- 940	- 740	- 650	- 620	- 600	- 540	- 300	- 200	- 180
SG-5	230	390	830	920	990	1070	1750	1910	1980	2000	2100	2580	2800	2950
SG-6	-3600	-3250	-2080	-1870	-1690	-1440	- 70	260	300	330	480	1230	1440	1730
SG-7	- 50	30	240	280	320	370	580	610	- 400	- 390	- 370	- 190	- 100	400
SG-8	(-5350 @ 106 Sec)		Lost ----------											
SG-9	-1170	-1180	-1220	-1220	-1260	-1280	-1230	-1200	-1190	-1180	-1130	- 920	- 860	Lost --
SG-10	Lost ----------													
SG-11	- 420	- 390	- 290	- 270	- 230	- 190	40	80	90	100	180	0	120	170
SG-12	Lost ----------													
SG-13	- 30	- 30	- 30	- 30	- 30	- 30	- 30	- 30	- 30	- 30	- 30	- 60	- 70	- 80
SG-14	-2020	-1980	-1880	-1840	-1810	-1780	-1750	-1690	-1680	-1660	-1600	-1300	-1230	- 210

(-) Negative Sign Indicates Compression

TABLE VI (Cont.)
W2SD-14A PHASE II
STRAIN AND DEFLECTIONS

GAGE NO.	TIME (SEC.)													
	164.5	165	165.5	166	166.5	167	167.5	168	168.5	169	169.5	170	170.5	171
	AXIAL LOAD (POUNDS)													
AXIAL	59595	60055	60240	60320	60056	59871	44950	51029	40436	39975	42370	45963	40897	41634
	OVERPRESSURE (PSIG)													
O.P.	28.30	28.70	29.10	29.70	20.07	13.05	3.61	2.41	2.41	3.01	3.21	3.61	3.41	3.21
	STRAIN (MICRO IN/IN)													
SG-1	0	0	10	20	- 20	- 120	- 200	750	800	850	700	- 200	-2300	- 30
SG-2	-2930	-2970	-3060	-3120	-2500	-1250	- 270	- 50	320	500	700	830	Lost ---	----
SG-3	- 10	- 20	0	30	- 80	- 900	-1300	-3750	-2350	-1800	-1150	- 550	- 150	400
SG-4	- 140	- 120	- 80	- 30	60	600	1700	400	1500	1400	1100	700	50	-1200
SG-5	3050	3160	3250	3400	3530	3620	3400	4500	5550	Lost ---	-------			
SG-6	1820	1980	2140	2320	2550	420	- 500	- 400	- 550	800	1300	1800	1900	- 700
SG-7	- 280	- 250	- 220	- 200	- 180	C	-2000	-2010	-1100	- 650	- 480	- 600	- 700	- 900
SG-8	Lost ---	-----												
SG-9	Lost ---	-----												
SG-10	Lost ---	----												
SG-11	180	230	200	-3200	100	Lost ---	----------							
SG-12	Lost ---	---												
SG-13	- 90	- 100	-1050	-2300	900	-1220	-1300	-1300	-1300	-1230	-1220	-1140	-1160	-1250
SG-14	-1200	- 420	-1400	-200	270	- 500	-1200	-1700	-2200	-2220	-22.6	-2240	-2260	-2391

(-) Negative Sign Indicates Compression

TABLE VI (Cont.)
W2SD-14A PHASE II
STRAIN AND DEFLECTIONS

GAGE NO.	TIME (SEC.) 0	3	5	6	8	10	18	19	20	40	60	80	84	85
	STRAIN (MICRO IN/IN)													
SG-15	0	20	50	- 10	- 10	- 20	20	30	50	30	50	- 50	- 70	- 80
SG-16	0	- 30	- 40	- 220	- 220	- 230	- 370	- 440	- 460	- 780	-1020	- 960	- 940	- 930
SG-17	0	0	0	- 20	- 30	- 30	- 10	0	0	- 10	- 40	- 170	- 180	- 190
SG-18	0	- 50	- 200	- 320	- 350	- 370	- 570	- 690	- 710	-1340	-2100	-2180	-2170	-2180
SG-19	0	0	20	0	- 30	- 40	20	30	30	20	- 20	- 230	- 270	- 280
SG-20	0	- 30	- 110	- 210	- 250	- 260	- 410	- 500	- 520	- 980	-1550	-1570	-1560	-1560
SG-21	0	0	20	30	20	0	20	30	40	40	70	0	- 20	- 20
SG-22	0	- 40	- 130	- 260	- 280	- 280	- 450	- 540	- 560	-1040	-1600	-1600	-1590	-1580
SG-23	0	- 10	- 50	- 90	- 120	- 130	- 170	- 180	- 190	- 310	- 360	- 420	- 430	- 430
SG-24	0	- 10	- 30	- 60	- 70	- 70	- 120	- 140	- 140	- 300	- 450	- 440	- 440	- 440
SG-25	0	40	130	200	210	210	370	440	470	910	1460	1470	1470	1470
SG-26	0	0	10	20	10	0	0	0	- 10	- 70	- 130	- 170	- 170	- 180
	DEFLECTION (INCHES)													
ED1-1	0	-.0002	0	0006	.0006	.0002	.0002	.0004	.0006	.0014	.0026	.0024	.0024	.0024
ED1-2	0	0	.0004	.0020	.0022	.0006	.0006	.0008	.0010	.0012	.0002	-.0036	-.0040	-.0042
ED1-3	0	0	.0006	.0014	.0014	.0008	.0020	.0022	.0024	.0036	.0048	.0044	.0044	.0042
ED1-4	0	-.0002	.0002	0	-.0002	-.0002	.0006	.0014	.0016	.0024	.0026	-.0010	-.0016	-.0020

(-) Negative Sign Indicates Compression

TABLE VI (Cont.)
W15D-14A PHASE II
STRAIN AND DEFLECTIONS

GAGE NO.	TIME (SEC.)													
	86	87	88	89	90	100	103	104	105	107	108	109	120	126
	STRAIN (MICRO IN/IN)													
SG-15	- 80	- 100	- 100	- 100	- 110	- 130	- 140	- 160	- 180	- 220	- 180	- 190	- 200	- 220
SG-16	- 940	- 940	- 940	- 940	- 930	- 920	- 920	- 920	- 910	- 880	- 900	- 900	- 840	- 820
SG-17	- 200	- 200	- 210	- 210	- 220	- 260	- 280	- 280	- 290	- 300	- 310	- 310	- 340	- 370
SG-18	-2180	-2180	-2190	-2200	-2210	-2290	-2320	-2330	-2320	-2220	-2330	-2400	-2500	-2510
SG-19	- 290	- 310	- 320	- 320	- 330	- 430	- 440	- 460	- 480	- 490	- 500	- 510	- 580	- 630
SG-20	-1560	-1560	-1560	-1570	-1580	-1620	-1630	-1630	-1630	-1530	-1580	-1680	-1770	-1740
SG-21	- 30	- 30	- 30	- 30	- 30	- 70	- 80	- 80	- 80	- 90	- 80	- 80	- 120	- 180
SG-22	-1580	-1580	-1580	-1590	-1600	-1620	-1620	-1620	-1610	-1510	-1560	-1620	-1620	-1580
SG-23	- 440	- 450	- 450	- 460	- 460	- 480	- 490	- 490	- 490	- 510	- 500	- 510	- 570	- 600
SG-24	- 430	- 430	- 430	- 440	- 440	- 440	- 450	- 450	- 440	- 420	- 430	- 450	- 440	- 430
SG-25	1470	1470	1470	1480	1480	1500	1500	1500	1490	1460	1480	1500	1520	1500
SG-26	- 180	- 180	- 180	- 190	- 190	- 200	- 200	- 200	- 200	- 200	- 210	- 220	- 280	- 300
	DEFLECTION(INCHES)													
ED1-1	.0024	.0024	.0024	.0024	.0024	.0020	.0020	.0020	.0020	.0018	.0018	.0020	.0016	.0014
ED1-2	-.0044	-.0046	-.0048	-.0050	-.0052	- 0076	-.0086	-.0096	-.0110	-.0134	-.0140	-.0194	Lost	
ED1-3	.0042	.0040	.0040	.0040	.0040	.0040	.0040	.0038	.0038	.0038	.0040	.0042	.0044	.0040
ED1-4	-.0024	-.0024	-.0026	-.0026	-.0026	-.0046	-.0052	-.0054	-.0056	-.0062	-.0062	-.0064	-.0080	-.0044

(-) Negative Sign Indicates Compression

TABLE VI (Cont.)
W25D-14A PHASE II
STRAIN AND DEFLECTIONS

GAGE NO.	TIME (SEC.)													
	130	134	140	141	142	143	146	147	147.5	148	151	160	163	164
	STRAIN (MICRO IN/IN)													
SG-15	- 220	- 210	0	70	1250	1700	2760	2830	2850	2880	3100	3860	4300	4400
SG-16	- 800	- 790	- 780	- 600	- 280	370	1760	1830	1850	1880	2100	Lost----	----------	--------
SG-17	- 370	- 380	- 380	- 370	- 330	- 310	- 150	- 130	- 110	- 100	- 80	100	190	250
SG-18	-2570	-2560	-2900	-3400	Lost --	----								
SG-19	- 680	- 690	- 780	- 810	- 940	- 980	-1300	-1370	-1380	-1400	-1490	-1800	-1960	-2000
SG-20	-1830	-1820	-2040	-2200	-3200	Lost --	-------							
SG-21	- 200	- 220	- 280	- 310	- 380	- 540	- 760	- 740	- 740	- 730	- 730	- 640	- 600	- 600
SG-22	-1600	-1580	-1650	-1700	-2100	-3100	Lost --	-----						
SG-23	- 610	- 620	- 660	- 660	- 690	- 710	- 760	- 770	- 780	- 790	- 800	- 840	- 870	- 880
SG-24	- 420	- 420	- 420	- 410	- 400	- 400	- 410	- 410	- 400	- 400	- 390	- 390	- 380	- 380
SG-25	1500	1490	1480	1480	1480	1490	1580	1570	1570	1560	1550	1560	1570	1530
SG-26	- 300	- 310	- 320	- 330	- 350	- 370	- 380	- 390	- 390	- 390	- 400	- 460	- 470	- 480
	DEFLECTION (INCHES)													
ED1-1	.0012	.0010	.0006	.0006	.0006	0	-.0006	-.0006	-.0008	-.0008	-.0010	-.0014	-.0016	-.0014
ED1-2	Lost --	---------	- ----											
ED1-3	.0040	.0040	.0040	.0040	.0038	.0038	.0038	.0040	.0040	.0040	.0038	.0032	.0026	.0022
ED1-4	-.0094	-.0100	-.0124	-.0160	-.0250	-.0380	-.0540	-.0548	-.0550	-.0552	-.0570	-.0642	-.0676	-.0684

(-) Negative Sign Indicates Compression

TABLE VI (Cont.)
W2SD-14A PHASE II
STRAIN AND DEFLECTIONS

GAGE NO.	TIME (SEC.)													
	164.5	165	165.5	166	166.5	167	167.5	168	168.5	169	169.5	170	170.5	171
	STRAIN (MICRO IN/IN)													
SG-15	4550	4800	4900	4600	4200	4870	4650	4600	4600	Lost				
SG-16	Lost													
SG-17	270	290	310	350	1780	1200	800	400	-1000	Lost				
SG-18	Lost													
SG-19	-2930	-2030	-2060	-2080	-2850	-2750	-2700	-2660	-2500	-2500	Lost			
SG-20	Lost													
SG-21	- 600	- 600	- 590	- 550	- 700	-2000	- 900	-3500	Lost					
SG-22	Lost													
SG-23	- 890	- 900	- 900	- 900	-1400	-1420	-2000	-2230	-2350	-2300	-2230	-2150	-2180	-2200
SG-24	- 380	- 380	- 380	- 380	0	170	600	650	630	500	220	50	- 100	- 120
SG-25	Lost													
SG-26	- 500	- 600	-2000	Lost										
	DEFLECTION (INCHES)													
ED1-1	-.0016	-.0014	-.0016	-.0018	-.0070	.0064	.0056	.0022	Lost					
ED1-2	Lost													
ED1-3	.0020	.0022	-.0020	Lost										
ED1-4	.0686	-.0692	-.0700	-.1000	Lost									

(-) Negative Sign Indicates Compression

TABLE VII
RH00283 PHASE I
STRAIN AND DEFLECTIONS

GAGE NO.	TIME (SECONDS)									
	0	10	20	30	40	50	60	65	80	86
	AXIAL LOAD (POUNDS)									
AXIAL	0	3730	7424	11266	15200	18968	22496	22404	794	0
	OVERPRESSURE (PSIG)									
OVER-PRESSURE	0	5.4	10.2	15.3	20.1	25.1	30.	29.6	2.8	0
	STRAIN (MICRO IN/IN)									
SG-1	0	0	14	30	40	60	120	120	20	0
SG-2	0	- 260	- 540	- 780	-1060	-1320	-1560	-1560	- 200	- 60
SG-3	0	0	10	20	40	60	100	100	20	0
SG-4	0	- 240	- 540	- 840	-1160	-1480	-1860	-1840	- 240	- 80
SG-5	0	6	14	26	34	50	60	50	10	0
SG-6	0	- 260	- 520	- 780	-1060	-1380	-1740	-1760	- 220	- 60
SG-7	0	0	- 10	- 20	- 30	- 40	- 40	- 40	0	- 20
SG-8	0	- 240	- 460	- 680	-1060	-1120	-1300	-1280	- 200	- 60
SG-9	0	0	- 20	- 40	- 60	- 80	- 140	- 140	- 60	- 40
SG-10	0	- 240	- 460	- 720	- 940	-1180	-1420	-1440	- 200	- 40
SG-11	0	20	30	40	50	60	50	20	0	- 20
SG-12	0	- 200	- 460	- 720	- 940	-1220	-1540	-1560	- 180	- 40
SG-13	0	10	20	40	50	60	70	66	20	0

(-) Negative Sign Indicates Compression

TABLE VII (Cont.)
RH00283 PHASE I
STRAIN AND DEFLECTIONS

GAGE NO.	TIME (SECONDS)									
	0	10	20	30	40	50	60	65	80	86
	STRAIN (MICRO IN/IN)									
SG-14	0	- 260	- 560	- 840	-1140	-1440	-1780	-1780	- 320	- 140
SG-15	0	0	10	14	20	26	40	34	0	- 20
SG-16	0	- 220	- 460	- 700	- 720	-1140	-1360	-1360	- 200	- 80
SG-17	0	0	0	0	0	0	0	0	0	0
SG-18	0	- 280	- 600	- 860	-1160	-1480	-1800	-1800	- 200	- 60
SG-19	0	0	- 20	- 40	- 60	- 80	- 80	- 100	- 40	- 20
SG-20	0	- 240	- 460	- 680	- 880	-1100	-1300	-1280	- 200	- 40
SG-21	0	0	20	40	60	60	80	80	20	0
SG-22	0	- 260	- 540	- 760	-1040	-1320	-1600	-1600	- 240	- 80
SG-23	0	- 140	- 280	- 380	- 480	- 540	- 600	- 600	- 140	- 80
SG-24	0	- 100	- 240	- 380	- 480	- 600	- 720	- 720	- 140	- 60
SG-25	0	100	260	440	600	800	1000	1020	200	60
SG-26	0	60	80	120	140	180	220	200	0	0

(-) Negative Sign Indicates Compression

TABLE VII
RH00283 PHASE II
STRAIN, DEFLECTIONS AND TEMPERATURE

GAGE NO.	TIME (SECONDS)														
	-10	0	15	30	32	58	59	60	61	62	63	64	65	66	[illegible]
RAM LOADS (POUNDS)															
P1	0	276	6366	12363	13194	23620	22124	22328	22420	23528	24912	25834	24543	25188	[illegible]
P2	0	644	1565	2671	3684	13815	14459	15933	15657	12526	10131	9946	10407	10131	[illegible]
P3	0	0	3226	7276	7562	7679	8284	7562	7226	4369	1344	420	336	302	[illegible]
STRAIN (MICRO IN/IN)															
SG-1	0	0	20	160	160	120	- 80	-1200	600	- 60	500	300	- 140	- 60	[illegible]
SG-2	0	0	100	240	240	80	0	- 100	-1120	-1500	600	100	- 140	- 200	[illegible]
SG-3	0	0	400	700	720	440	280	160	240	- 360	1300	1500	600	- 300	[illegible]
SG-4	0	60	140	300	260	- 400	- 640	- 600	- 400	600	860	800	- 600	-2200	[illegible]
SG-5	0	0	- 300	- 600	- 640	- 880	-1000	-1200	-2400	-7200	-6200	-6100	-6140	-6200	[illegible]
SG-6	0	- 20	- 180	- 180	- 180	- 280	-1800	-3160	-2580	-2400	-2460	-2160	-1800	-1840	[illegible]
SG-7	0	- 60	- 760	-1460	-1500	-2100	1000	Lost---	-------						
SG-8	0	40	- 420	- 700	- 740	- 540	- 200	500	840	440	- 260	- 700	-1500	- 860	[illegible]
SG-9	0	0	- 20	0	0	200	400	2600	1000	1400	1360	1340	1260	1260	[illegible]
SG-10	0	0	0	- 20	- 20	- 80	- 140	- 600	- 940	- 280	700	1520	400	360	[illegible]
SG-11	0	0	- 20	- 100	- 80	- 60	- 100	- 140	800	300	260	280	280	200	[illegible]
SG-12	0	0	- 60	- 140	- 140	80	0	- 100	- 200	- 200	100	560	600	600	[illegible]
SG-13	0	0	60	160	180	400	480	560	600	200	-1000	-2400	-3400	-3660	[illegible]
SG-14	0	0	160	200	180	180	1100	1400	840	1080	1120	1040	900	840	[illegible]

(-) Negative Sign Indicates Compression

TABLE VIII (Cont.)
RH00283 PHASE II
STRAIN, DEFLECTIONS AND TEMPERATURE

GAGE NO.	TIME (SECONDS)														
	-10	0	15	30	32	58	59	60	61	62	63	64	65	66	67
	STRAIN (MICRO IN/IN)														
SG-15	0	0	140	220	220	260	400	600	2600	3900	2400	1000	900	760	660
SG-16	0	0	160	320	340	960	500	- 80	600	1200	1500	400	100	- 140	- 120
SG-17	0	0	- 20	- 40	- 60	- 120	- 260	Lost --------							
SG-18	0	0	60	240	240	260	160	0	-3400	-1000	2200	Lost ------			
SG-19	0	0	40	80	80	60	40	60	60	- 800	Lost --------				
SG-20	0	0	140	360	380	160	60	180	400	800	900	700	2140	1700	1900
SG-21	0	0	40	160	180	220	340	360	120	1400	Lost ------				
SG-22	0	- 20	- 160	- 560	- 580	- 600	Lost --------								
SG-23	0	0	- 120	- 180	- 180	- 80	Lost --------								
SG-24	0	0	- 380	- 780	- 820	-1200	Lost --------								
SG-25	0	0	0	20	20	120	- 240	60	Lost --------						
SG-26	0	0	- 60	- 200	- 200	- 80	- 60	- 40	- 900	Lost --------					
SG-27	0	0	- 20	- 40	- 40	80	60	40	20	Lost --------					
SG-28	0	0	- 40	- 100	- 120	- 80	- 60	- 80	- 160	- 280	- 300	- 420	0	800	1200
SG-29	0	0	40	80	100	260	400	560	200	2000	Lost --------				
SG-30	0	0	80	140	140	140	3100	Lost --------							
SG-31	0	0	40	40	40	140	-4800	-3200	-2100	-1500	0	1000	3300	- 920	-1900
SG-32	0	0	80	180	200	420	Lost ------								

(-) Negative Sign Indicates Compression

TABLE VIII (Cont.)
RH00283 PHASE II
STRAIN, DEFLECTIONS AND TEMPERATURE

GAGE NO.	TIME (SECONDS)														
	-10	0	15	30	32	58	59	60	61	62	63	64	65	66	67
	STRAIN (MICRO IN/IN)														
SG-33	0	0	- 140	- 360	- 390	- 660	-2260	- 660	-1600	- 800	260	Lost ----			
SG-34	0	0	140	240	220	0	40	- 40	Lost ----------						
SG-35	0	- 40	240	540	560	360	400	700	860	900	Lost ----------				
SG-36	0	- 20	400	840	860	720	820	900	1400	2400	2800	Lost ----------			
SG-37	0	- 20	- 60	- 100	- 120	- 400	- 700	-1320	-2900	-2800	-2200	-1800	-1500	-1900	-2360
SG-38	0	0	- 620	-1160	-1240	-1740	Lost ----------								
SG-39	0	0	- 260	- 520	- 540	0	-1840	-1200	-2360	- 100	Lost ----------				
SG-40	0	0	- 440	- 860	- 940	-1360	Lost ----------								
SG-41	0	0	- 20	- 60	- 60	- 40	- 240	- 800	1600	3000	Lost ----------				
SG-42	0	0	0	- 40	- 40	20	60	100	600	Lost ----------					
SG-43	0	20	- 80	- 200	- 200	- 40	200								
SG-44	Not Available														
SG-45	0	0	60	40	20	0	- 160	- 340	- 800	- 600	- 300	- 300	- 100	20	- 20
SG-46	0	0	180	80	40	- 40	- 320	-2900	Lost						
SG-47	Not Available														
SG-48	0	0	80	120	120	360	Lost ----------								
SG-49	0	0	460	920	940	540	300	200	60	- 600	- 560	- 520	- 460	- 440	- 420
SG-50	0	0	- 800	-1680	- 780	-2220	-1160	- 760	- 800	- 460	- 320	- 260	- 120	0	0

(-) Negative Sign Indicates Compression

TABLE VIII (Cont.)
RH00283 PHASE II
STRAIN, DEFLECTION AND TEMPERATURE

GAGE NO.	TIME (SEC.)														
	-10	0	15	30	32	58	59	60	61	62	63	64	65	66	67
ED1-1	Not Available														
ED1-2	Not Available														

GAGE NO.	TIME (SEC.)														
	-10	+18	30	32	38	58	59	60	61	62	63	64	65	66	67
	TEMPERATURE (°F)														
TC-1	86	86	143	148	153	158	156	154	152	150	149	147	146	145	142
TC-2	85	85	150	155	160	163	161	158	155	153	152	150	149	148	146
TC-3	86	86	160	165	170	172	170	166	163	160	159	157	156	156	156
TC-4	85	85	141	146	153	156	155	154	152	150	149	147	146	145	145
TC-5	85	85	153	156	161	164	162	159	156	155	153	151	150	149	148
TC-6	83	83	156	160	164	165	163	160	156	156	155	154	154	153	153
TC-7	84	84	180	181	183	180	176	170	166	163	161	159	156	155	154
TC-8	83	83	140	146	150	Lost									
TC-9	88	88	154	166	172	175	173	170	166	164	161	160	159	157	156
TC-10	84	84	153	165	165	164	161	157	153	151	149	146	145	143	142
TC-11	85	85	138	148	152	154	152	150	146	146	143	141	140	140	138
TC-12	83	83	143	155	159	158	156	153	150	147	145	143	141	141	139

TABLE IX
RH00283 PHASE III
STRAIN, DEFLECTION AND TEMPERATURE

GAGE NO.	TIME (SECONDS)																
	-20	-10	0	10	17	25	27	35	55	60	65	80	90	116	126	160	170
	RAM LOADS (POUNDS)																
P1	0	276	23343	25650	16914	12455	12548	12732	23066	22144	21959	4613	4982	23712	23343	922	0
P2	0	1105	23025	21183	12433	2763	2210	2486	20078	21459	21459	5802	4605	22104	23025	1031	0
P3	0	33	1502	5624	7360	7384	7228	4789	588	453	235	218	100	0	0	0	0
	STRAIN (MICRO IN/IN)																
SG-1	0	0	- 240	- 160	60	200	220	240	40	60	160	440	520	260	240	360	340
SG-2	0	0	- 180	- 60	140	260	280	300	- 40	- 40	- 40	60	0	- 160	- 200	- 120	- 140
SG-3	0	- 40	-1160	- 860	- 120	680	760	800	- 520	- 760	- 720	100	140	- 560	- 660	200	240
SG-4	0	- 20	-1400	-1200	- 600	200	240	260	-1260	-1400	-1460	- 640	- 640	-1660	-1680	- 320	- 240
SG-5	0	- 40	- 420	- 600	- 540	- 540	- 540	- 580	- 720	- 680	- 680	- 320	- 280	- 600	- 560	- 40	- 20
SG-6	0	0	- 340	- 360	- 240	- 160	- 160	- 180	- 160	- 80	- 60	240	200	- 160	- 160	200	220
SG-7	0	[illegible]	-1060	-1360	-1360	-1340	-1350	-1460	-1300	-1060	-1040	0	- 120	-1080	-1060	60	60
SG-8	0	[illegible]	- 460	-1000	- 860	[illegible]	[illegible]	[illegible]	- 820	- 680	- 640	40	80	- 760	- 800	0	0
SG-9	0	20	0	160	80	20	0	0	60	80	100	120	200	380	420	260	240
SG-10	0	180	-	80	0	0	60	40	0	20	40	80	120	160	200	200	220
SG-11	0	- [illegible]	- 2	- 40	- [illegible]	- [illegible]	160	- 160	- 120	- 100	- 120	- 80	- 40	20	40	- 20	0
SG-12	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	- 140	260	340	360	380	400	360	340	240	260
SG-13	0	0	140	200	260	140	160	[illegible]	380	440	480	560	660	820	800	580	620
SG-14	0	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	- 140	- 220	- 280	- 460	- 540	- 260	- 220	- 200	- 180

(+) Negative Sign [illegible]

TABLE IX (Cont.)
RHO0283 PHASE III
STRAIN, DEFLECTION AND TEMPERATURE

GAGE NO.	TIME (SECONDS)																
	-20	-10	0	10	17	25	27	35	55	60	65	80	90	116	126	160	170
	STRAIN MICRO IN IN)																
SG-15	0	0	160	240	240	200	200	180	60	40	20	- 60	40	300	320	140	140
SG-16	0	0	280	380	360	300	300	320	360	340	340	80	100	400	380	2	- 20
SG-17	0	0	- 80	- 100	- 80	- 60	- 60	- 60	- 80	- 100	- 80	- 60	- 120	- 240	- 280	- 240	- 220
SG-18	0	0	- 260	- 160	40	260	280	340	140	140	200	540	620	380	320	400	340
SG-19	0	- 20	- 80	- 40	20	100	100	120	0	- 20	0	20	40	- 20	- 40	0	0
SG-20	0	- 60	- 70	- 50	- 100	380	420	460	- 360	- 460	- 400	60	120	- 460	- 520	40	40
SG-21	0	0	- 60	40	120	140	160	160	80	60	80	120	140	60	40	40	20
SG-22	0	- 20	- 400	- 600	- 580	- 560	- 560	- 480	- 40	160	260	820	860	280	220	480	440
SG-23	0	0	- 180	- 240	- 200	- 180	- 160	- 160	- 80	- 40	- 20	160	180	- 20	- 40	80	80
SG-24	0	- 40	- 820	-1060	-1000	- 900	- 920	- 960	-1200	-1070	-1100	- 460	- 560	-1340	-1300	- 420	- 360
SG-25	0	- 40	0	0	0	0	0	0	40	60	120	240	380	460	460	440	400
SG-26	0	0	180	60	- 100	- 220	- 220	- 200	60	140	160	200	240	360	380	280	260
SG-27	0	0	0	- 20	- 40	- 40	- 40	- 20	120	180	220	420	540	620	600	520	500
SG-28		20	200	160	60	- 80	- 100	- 140	20	40	40	- 60	- 60	-	120	60	60
SG-29		- 20	60	140	140	120	100	60	240	200	240	360	520	640	640	540	500
SG-30		0	360	220	200	160	140	60	- 120	- 200	- 240	- 340	- 360	- 360	- 320	- 360	- 340
SG-31	0	0	40	60	60	40	40	40	120	80	220	380	500	600	580	460	420
SG-32	0	- 20	220	260	240	200	200	220	360	320	380	520	600	640	620	520	480

(-) Ne[illegible] Strain Indicates Compression

TABLE IX (Cont.)
RH00283 PHASE III
STRAIN, DEFLECTION AND TEMPERATURE

GAGE NO.	TIME (SECONDS)																
	[illegible]	-10	0	10	17	25	27	35	55	60	65	80	90	116	126	160	170
STRAIN (MICRO IN/IN)																	
SG-33	[illegible]	- 20	- 440	- 540	- 440	- 360	- 360	- 400	- 640	- 680	- 720	- 520	- 560	-1000	-1040	- 660	- 640
SG-34	[illegible]	- 40	- 400	- 360	- 160	[illegible]	200	160	- 660	- 840	- 920	- 800	- 760	-1000	-1040	- 660	- 620
SG-35	[illegible]	- 40	- 240	- 100	120	[illegible]	- 60	[illegible]	- 280	- 400	[illegible]	- 280	- 240	- 420	- 440	- 280	- 260
SG-36	[illegible]	- 40	- 840	- 480	160	500	840	760	- 700	- 880	- 920	- 520	- 460	-1060	-1060	- 360	- 320
SG-37	[illegible]	0	- 460	- 440	- 260	- 120	- 120	- 160	- 620	- 640	- 560	- 400	- 460	- 460	- 980	- 400	- 300
SG-38	[illegible]	- 40	-1000	-1360	-1320	-1340	-1320	-1340	-1100	- 920	- 900	160	80	-1020	-1020	- 40	0
SG-39	[illegible]	0	- 600	- 840	- 860	- 840	- 840	- 800	- 760	- 740	- 740	- 360	- 420	- 840	- 840	- 480	- 460
SG-40	[illegible]	0	- 560	- 860	- 860	- 860	- 860	- 900	- 900	- 840	- 860	- 340	- 420	-1140	-1120	- 420	- 360
SG-41	[illegible]	[illegible]	- 40	- 40	[illegible]	[illegible]	[illegible]	[illegible]	- 140	- 140	[illegible]	- 40	0	- 40	- 40	- 60	- 40
SG-42		[illegible]	40	0	[illegible]	[illegible]	[illegible]	[illegible]	- 60	- 60	- 60	- 20	40	120	140	60	60
SG-43	[illegible]	20	120	500	200	[illegible]	- 160	[illegible]	280	320	280	- 20	- 100	240	260	- 200	- 200
[illegible]	[illegible]																
[illegible]			[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	- 160	[illegible]	[illegible]	- 20	[illegible]	- 60	[illegible]	[illegible]
[illegible]			[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	- 540	[illegible]	[illegible]	[illegible]	[illegible]	- 540	[illegible]	[illegible]
[illegible]	[illegible]																
[illegible]			[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	40	[illegible]	[illegible]	[illegible]	[illegible]	- 160	[illegible]	[illegible]
[illegible]			- 60	[illegible]	20	[illegible]	[illegible]	[illegible]	[illegible]	- 940	[illegible]	- 660	[illegible]	[illegible]	-1200	- 500	[illegible]
[illegible]			[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	-1140	[illegible]	[illegible]	- 200	[illegible]	-1320	- 32	[illegible]

(-) [illegible] Compression.

TABLE IX (Cont.)
RH00283 PHASE III
STRAIN, DEFLECTION AND TEMPERATURE

GAGE NO.	TIME (SECONDS)																
	-20	-10	0	10	17	25	27	35	55	60	65	80	90	116	126	160	170
	DEFLECTION (INCHES)																
ED1-1	Lost Bad ----																
ED1-2	Lost Bad----																
	TEMPERATURE (°F)																
TC-1	75	76	78	104	133	139	170	245	26.	280	289	283	263	231	222	205	200
TC-2	75	76	80	105	135	142	177	264	287	306	315	309	283	249	241	224	221
TC-3	75	77	81	110	145	152	191	287	209	330	342	328	303	265	254	237	232
TC-4	75	76	78	100	128	134	165	241	260	276	288	282	260	231	221	202	199
TC-5	75	76	80	107	139	245	182	273	296	316	330	319	295	260	250	231	223
TC-6	75	76	80	108	142	148	185	276	300	319	327	316	287	250	241	222	217
TC-7	75	77	82	120	162	171	215	319	342	361	371	348	309	264	251	231	226
TC-8	75	76	78	100	128	134	164	241	264	283	292	285	264	234	226	207	204
TC-9	75	76	7[illegible]	100	142	152	192	296	321	355	373	367	338	300	282	246	24[illegible]
TC-10	75	75	73	102	143	152	192	288	309	340	353	334	301	257	242	208	200
TC-11	75	76	76	95	127	134	168	250	269	295	308	302	280	249	235	206	192
TC-12	75	76	76	100	134	142	178	264	284	313	322	311	280	244	227	197	[illegible]

(-) Negative Sign Indicates Compression

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